JULY 1960

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

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PMM

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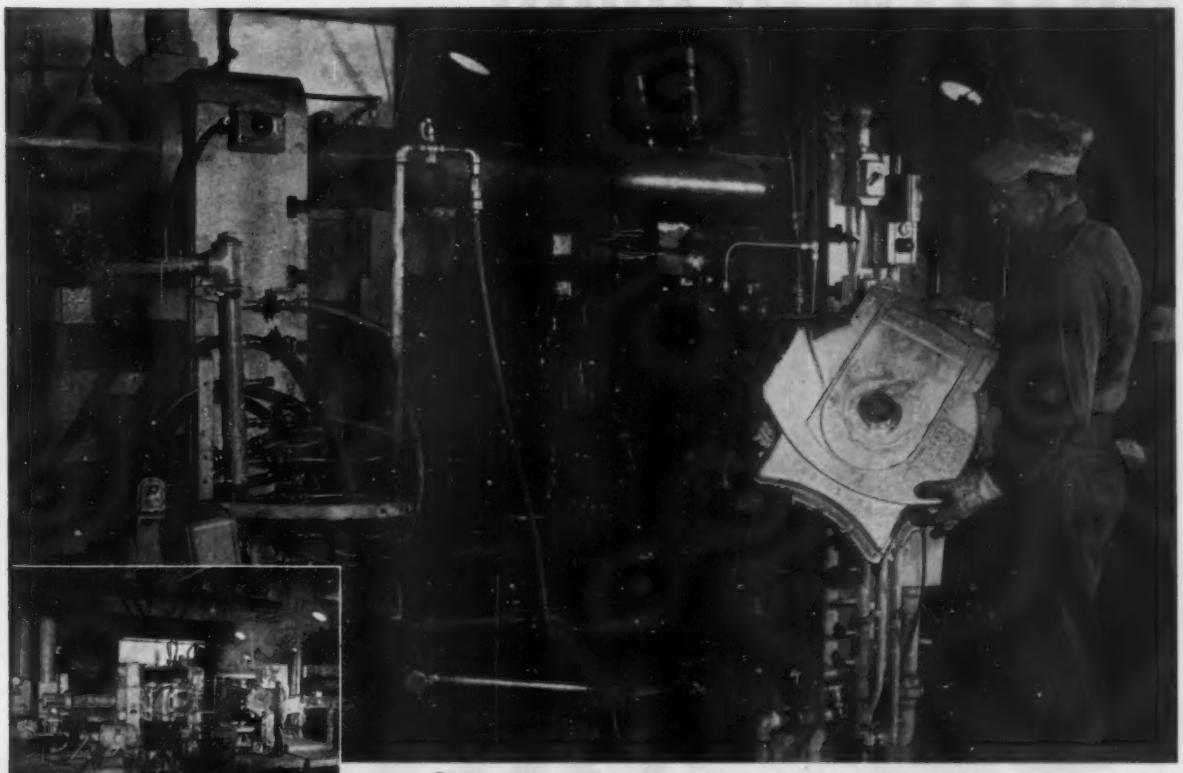

● Big, solid 17 lb. castings are housings for rotary power lawn mowers. Production averages 80 housings per hour. This is a 1000-ton Cast-Master Die Casting machine — one of two in this plant.

● All operating elements of this efficient 1000-ton Cast-Master are conveniently accessible for instant adjustment or inspection.

● Cast housings are removed from die, inspected and then dunked in the cooling tank at right. Parts are conveyor fed to trimming presses, then drilled and cleaned prior to assembly.

● Minor finishing is required after trimming. The racks in background represent about one-half hour's production for one machine.

"CAST-MASTER'S TOGGLE CLAMPING GIVES US UNIFORM DENSITY-LESS FLASH"

G. L. Graft, Divisional Supt. for The Newark Ohio Company Newark, Ohio stated, "We like Cast-Master's die locking toggle mechanism and the rugged qualities of these machines. They've been doing a fine job for us on all sizes of castings up to 17 lbs. each. They're fast; scrap loss and flash are negligible." This company manufactures Kenmore Electric Ranges and Craftsman Rotary Power Lawn Mowers, exclusively for Sears, Roebuck and Company.

If you're moving into the die casting field involving new, larger castings, investigate the Cast-Master line of high production die casting machines — 100-ton to 2000-ton capacities—cold chamber or hot chamber models. Write for Bulletin CM-100.

H26

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IN THIS ISSUE

July, 1960: Volume 18 Number 7

FEATURE ARTICLES

OUR COVER—

Small parts are deburred with crushed shell pellets as they pass two airless blasting wheels. July cover photographs are by courtesy of Wheelabrator Corp.

33 IRVING B. HEXTER 1897-1960

Founder of the Industrial Publishing Corporation.

34 ONE METER CASE, THREE PMM PROCESSES

Cost and weight, iron or aluminum, all are factors which help decide whether to use a sand, shell mold or die casting process.

36 PURCHASING EXTRUSIONS

Lack of understanding between supplier and buyer, of an extruded shape, is the most common reason for dissatisfaction.

40 CASTINGS CORPORATION SOLVES PERMANENT MOLD PROBLEMS

New lubricant is successful in breaking aluminum castings from the mold with a minimum breakage loss.

41 HEAT TREATING A HIGH HARDNESS, HOT WORK TOOL STEEL

A new hot-hardness tool steel makes three times as many brass die castings as does a 9% tungsten steel.

42 STEEL AND SPECIALTY ALLOY EXTRUSIONS

Part III concludes the series on steel extrusions and gives actual applications how buyers saved by redesigning.

44 BONDING ALUMINUM TO STEEL

Case histories which show applications of the Al-Fin process, Part II.

46 LOW COST MACHINING ELIMINATES COINING

Relatively inexpensive compacting tools are used to form a sintered steel (copper infiltrated) core.

48 SINTERED BEARING AND STRUCTURAL PART

Out-of-the-way bearings are made durable, in different sizes, and inexpensively.

48 NEW HEEL TIPS BY SINGLE CAVITY MOLDING

Milady's high heels are stronger and wear longer with new tips.

49 SWITCH COSTS CUT—PARTS ARE DIE CAST

Cost and labor savings, also more rigid components are realized when die casting switch parts.

49 COPPER-IRON SINTERING

Use them where impact and corrosion resistance are required, such as lawnmowers.

FINISHING SECTION

53 MECHANICAL BURR REMOVAL

Burrs are removed quickly, inexpensively when new mechanical processes are used to fine finish parts cast for precision mechanical devices.

57 CAN DIE CASTINGS BE ANODIZED?

One manufacturer finds he can color, enamel, weld or braze a new aluminum alloy casting.

DEPARTMENTS

10 Casting About
12 New Products
28 Industry News
31 Letters
58 Useful Literature
71 Data in Ads
76 Foundry Show Literature
77 Opportunities

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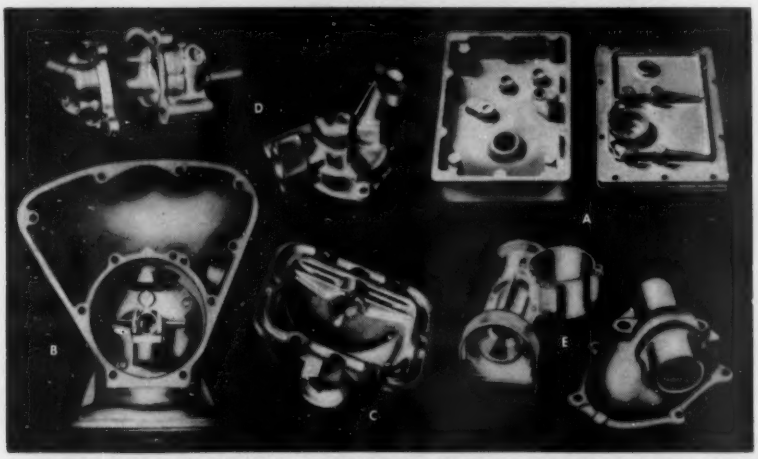
All Star Cast for Your Production

AL MAG

COST SAVING—EFFICIENT ALUMINUM and MAGNESIUM DIE CASTINGS by LITEMETAL



The diversified group of products shown above illustrates some of the effective uses of the die casting method in obtaining greater scope for the designer, and material, labor and weight savings. Included are: (A) Aluminum Gear Box and Cover for Ice Machine, (B) Magnesium Chain Saw Gear Case, (C) Aluminum Power Take-Off Gear Box, (D) Magnesium and Aluminum Automotive Oil Pump Bodies, (E) Aluminum Lawn Mower Gear Boxes.

Before planning production runs, it may well pay you to check the many factors that could indicate great advantages for your product through the selection of aluminum or magnesium alloy die castings. Many of the advantages obtainable through the use of these lightweight alloys are listed below:

1. Clean, smooth, flat gasket faces are provided without machining.
2. Die casting has the ability to provide cast ribs and controlled wall thickness, making for rigidity and consistently accurate shaft and bearing alignment.
3. Cast bolt holes can be provided.
4. Complexity possible in die casting often permits combining several parts into one.
5. Aluminum and magnesium die castings are neat and smooth in appearance.
6. Machine stock allowance, if required, is minimized.
7. For well lubricated, low load applications this method often eliminates bearings by permitting the shaft to run directly in the die casting.
8. These alloys don't rust . . . can usually be left unpainted.
9. The light weight of magnesium and aluminum reduces shipping and handling costs.

Our expanded facilities now establish LITEMETAL as one of the few companies actively producing die castings from aluminum, magnesium and zinc. Additional facilities offered by LITEMETAL include plating and finishing to hardware standards through affiliated sources, placing at your disposal an integrated time-saving service, coupled with LITEMETAL skill and efficiency.

These symbols are important to you! To better serve our customers, LITEMETAL, through active participation with other die casters in various committees of the American Die Casting Institute, is constantly kept informed of the latest techniques, materials and other equipment that are advantageous to the die casting process.

DIE CASTING RESEARCH FOUNDATION PARTICIPANT

Write today for literature and design information. Quick action on inquiries.

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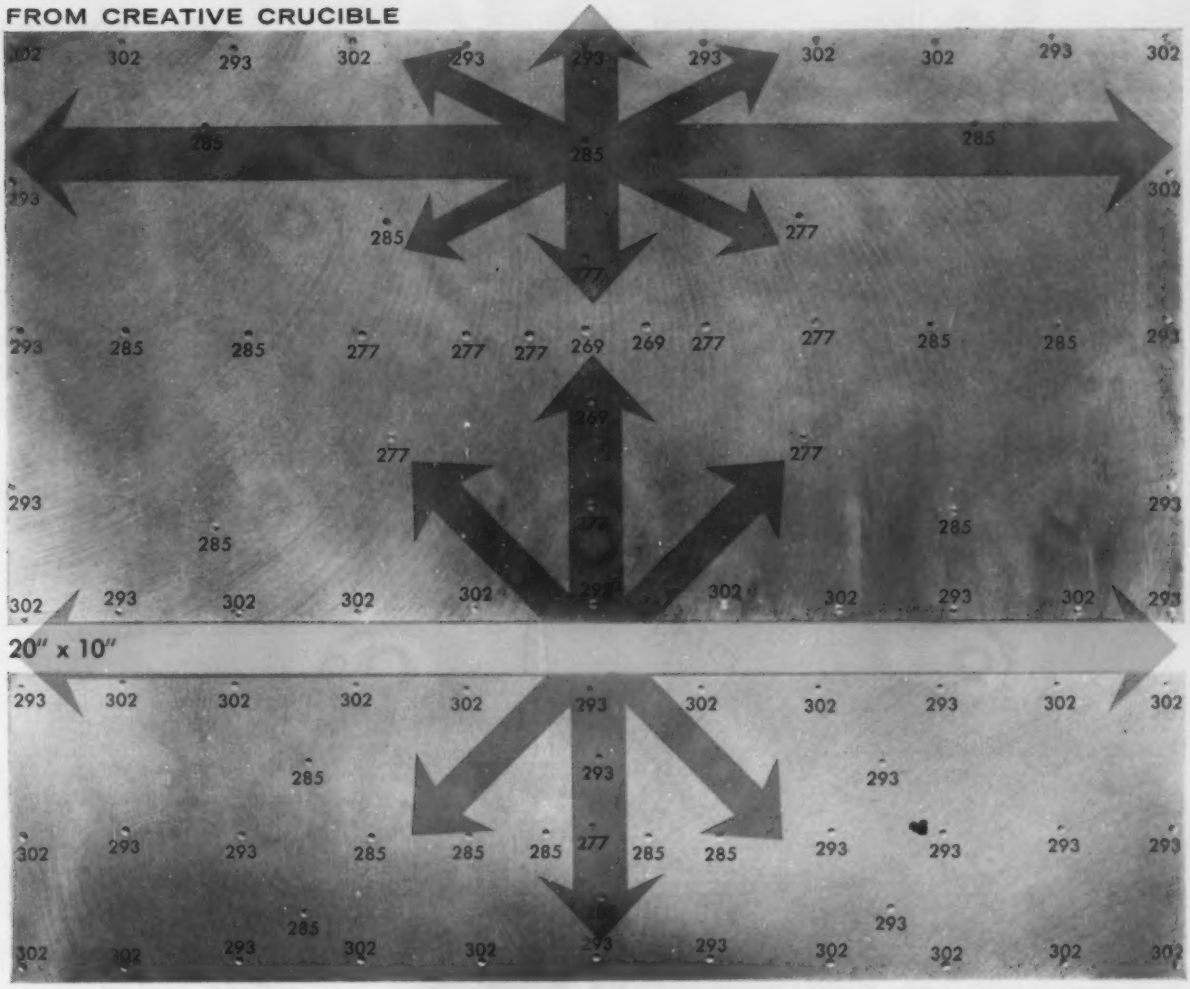

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Now you can make larger plastic molds and die casting dies—for longer runs—and get better finishes!

Notice the small hardness gradient—across the surface and from surface to center—of these typical blocks of prehardened CSM 2. This small gradient indicates the more uniform hardness of CSM 2—and assures you of at least 5 major benefits:

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Complete details on Crucible CSM 2—either prehardened or annealed—are readily available through local Crucible steel service centers. For data, call the center nearest you or write: *Crucible Steel Company of America, Dept. TG27, Pittsburgh 30, Pa.*

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emblem of a new era . .

. . in die casting

IT'S TIME TO RE-EVALUATE YOUR DIE CASTING SOURCES!

Periodically American industry gains another springboard for progress through the reorganization of a long-established firm to provide increased capabilities, better services and improved products. Precision Castings Company, Division of Precasco Corporation, one of the Fulton Industries, Inc. group offers an outstanding example.

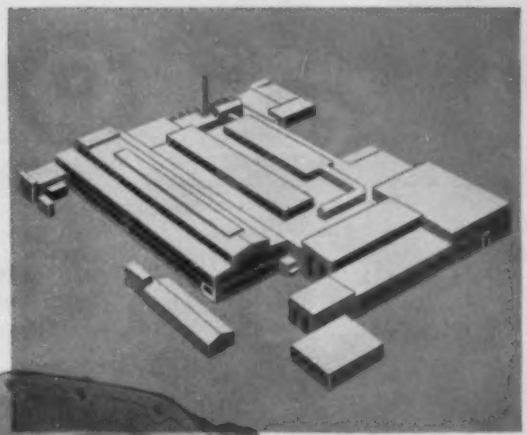
The aggressive programs being carried out at Precision lead the way into a new era of die casting . . . and a new era of benefits.

A streamlined corporate structure puts fresh emphasis on customer service. Relocated field offices extend this service. Accelerated research is finding ways to meet the requirements of the '60's, and beyond.

Realigned operating management insures a new high order of quality control, and improved traffic both in and out of Precision's plants.

Progressive modernization of all production equipment enables us to provide better-made, better-finished products.

Thus, our new hallmark signifies the dynamic force and broadened scope of the new Precision Castings Company . . . producing the finest zinc and aluminum die castings for *precision-minded* manufacturers.



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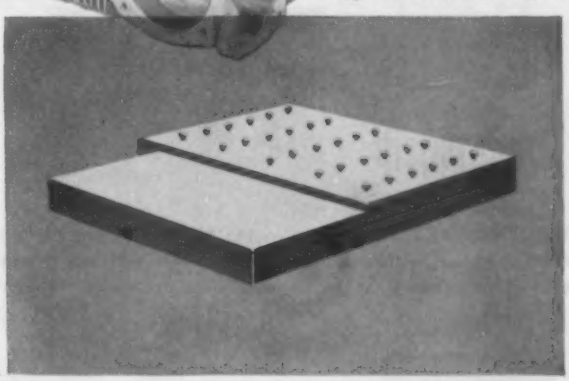

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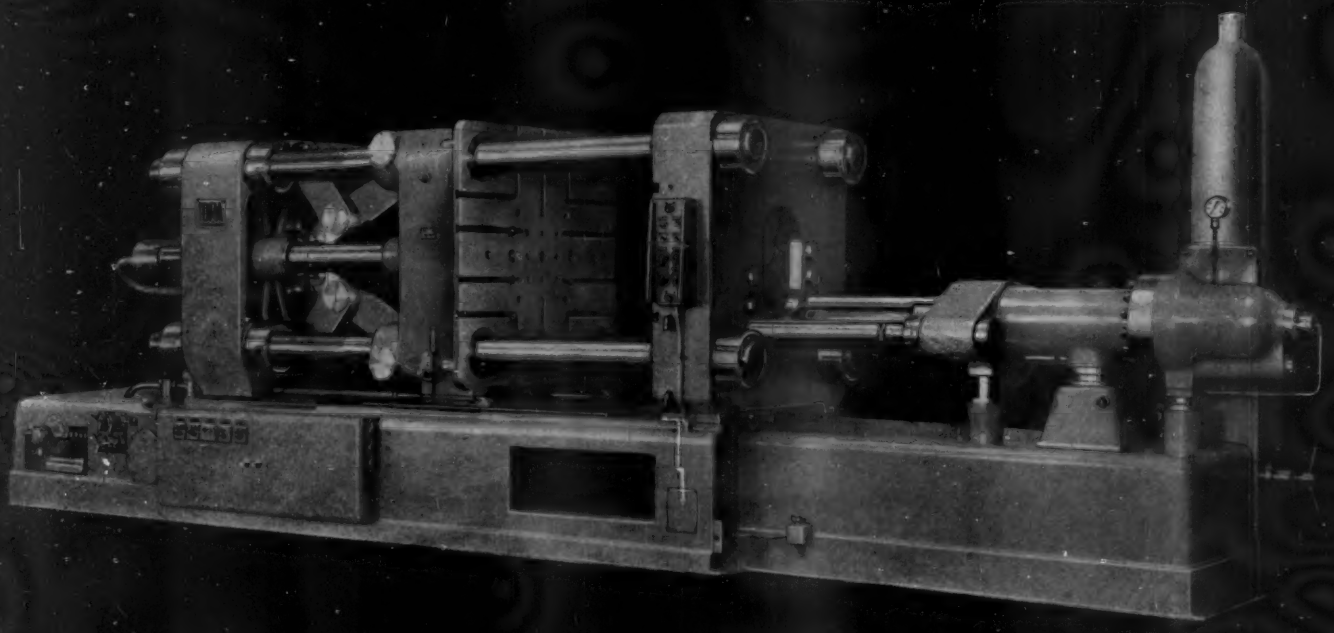
DIE CASTING MACHINES



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HORIZONTAL COLD CHAMBER
(880 TONS LOCKING PRESSURE)

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SPECIFICATIONS:

LOCKING PRESSURE	880 tons
INJECTION PRESSURE	82,5 tons
DIMENSIONS OF PLATENS	51" x 51"
SPACE BETWEEN TIE BARS	31 1/2" x 31 1/2"
MOVABLE PLATEN STROKE	20 11/16"
MAX. HEIGHT OF DIES	39 3/8"
MIN. HEIGHT OF DIES	18 3/4"
FREE CYCLE PER MIN.	4 n.
MAX. WEIGHT OF ALUMINIUM PER SHOT	30,86 lbs.

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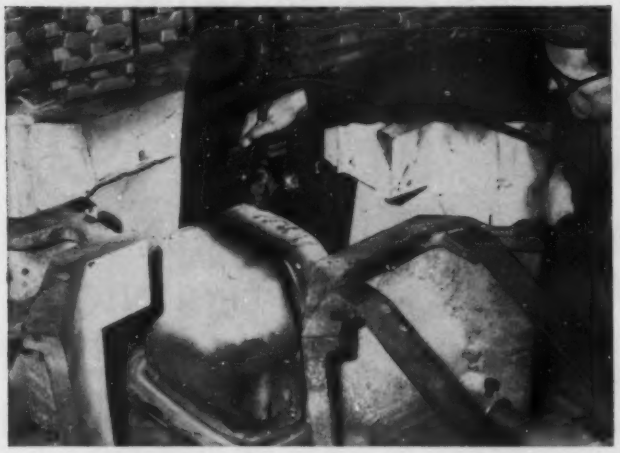
AQUADAG® SOLVES AN INTRICATE MOLD PROBLEM FOR OSWEGO CASTINGS



A complete permanent mold, used in casting high-pressure gas meter housings, is shown being sprayed with 'Aquadag'.

The problem at Oswego Castings Corporation, Oswego, New York, a division of Oberdorfer Foundries, Incorporated, involved the effective metal flow and release of aluminum castings. Frequent breakage occurred due to the complexity of the part . . . a gas meter housing containing an integral rib down the center. In the mold core, the relatively tiny aperture for forming the rib, plus the rounded corners which provide the outer "bucket" appearance to the housing, demanded a release agent that would permit easy extraction and proper metal flow.

According to Frank Fox, Production Foreman in the Oswego foundry, previous to adopting the use of an Acheson dispersion, removing the aluminum casting from the rib aperture took as long as three or four hours. Even with such care, sticking caused many castings to break at the point of the rib.

There was also the problem of metal flow. Housing walls vary in thickness between ¼ inch and the ⅝ inch flange which runs around the top. Close tolerances must be maintained to insure a proper fit during final assembly. "Holidays" caused by the improper flow of metal into critical areas of the cavity, presented a constant reject problem.

Several mold washes were tried unsuccessfully before Oswego engineers turned to 'Aquadag'—a dispersion of colloidal graphite in water. In their application, Oswego dilutes the concentrated material 1 to 3 with water. Normal commercial spray equipment is used in applying an even coating on all mold surfaces . . . one coating holding up through a run of eight to ten pieces. The 356 aluminum alloy used for the housing castings, is poured at 1400°F. The mold is preheated to 700°F. and maintained at that temperature through the casting cycle.

With 'Aquadag', the savings at Oswego have been "considerable". Castings are more uniformly formed, have smoother surface finish, and part easily. Because of greatly facilitated metal flow and release, mold life is lengthened. Rejects are the exception rather than the rule.

Oswego Castings manufactures several products with highly defined parts which require molds having intricate sliding members or collapsible cores. The fact that finding the effective lubricant they needed to overcome their *most difficult* problem, resulted in the selection of an Acheson product . . . indicates it can be of equal value to you. We invite your inquiry.

Literature Describes Production Economies In Metal Casting

A detailed discussion of the various Acheson semi-colloidal and colloidal dispersions available for coating permanent molds, die cavities, and steel and cast-iron chills, is contained in Acheson Bulletin 425. It describes why Acheson colloidal graphite is so extensively used as a mold and die lubricant, as well as an extremely effective heat-resistant parting agent. The microscopically fine graphite particles are suspended in a variety of liquid carriers. When mixed with the appropriate diluent, the dispersion can be conveniently applied by spraying, brushing, dipping, or swabbing. As mold coatings they provide greater, more uniform surface coverage. Highly tenacious, these thin coatings resist the scouring action of molten metal, do not volatilize, and will not build up. Sticking in the mold is reduced to a minimum; usually eliminated completely. Less finishing is required, rejects are fewer, and die and mold life is extended.

Additional protection of casting machines, conveyor chains, and other plant equipment is also described in Bulletin 425. The heat-resistant, non-gumming characteristics of Acheson colloidal graphite are ideally suited for the high operating temperatures of most foundry machinery. Should yours be a special lubricating problem not covered in this literature, let us hear from you. Industry experience has been that in our complete product line there is an Acheson dispersion "tailor-made" for your metal casting application.

We invite you to send for your copy of Bulletin 425, "Colloidal Dispersions For Use In Metal Casting", at your earliest convenience. It should prove helpful to you in realizing greater production economies. Write direct to Dept. PM-70.

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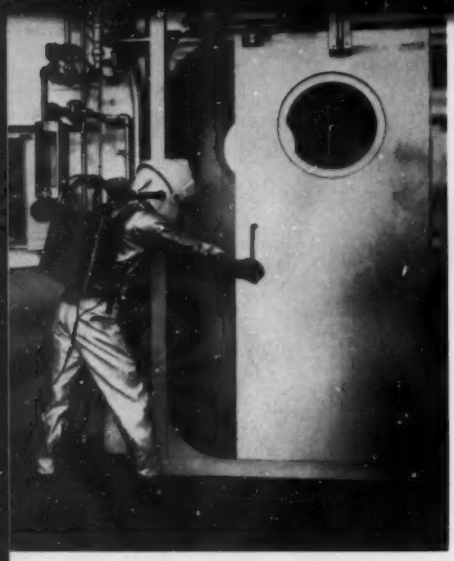


CASTING ABOUT

technical news of applications & processes involving precision metal molding

INERT ATMOSPHERE METAL FABRICATION - A NEW TECHNIQUE

A NEW TECHNIQUE in the fabrication of metals may be in the making with the InFab (Inert-Fabrication) facility just installed at the Universal-Cyclops Steel Corp.'s plant in Bridgeville, Pa.

The new fabricating unit operates in a sealed space filled with high purity Argon. The basic idea is for hot working the refractory metals such as molybdenum, tungsten, columbium, and tantalum. These metals must be hot rolled, forged, and otherwise worked at from 3700°F to about 4500°F or higher. At these temperatures both oxygen and nitrogen are deadly enemies of the metals.

In the argon atmosphere, which is 99.995% argon, the metals can be worked without danger of gas contamination.

The metals start out as powders. They are compressed by isostatic methods into cylindrical ingots and then sintered in a hydrogen furnace to make billets. A series of billets is fastened together and then melted in a vacuum-arc furnace. This procedure gives a final product which is free of inclusions, dissolved gases, and other impurities. After surface cleaning the billets are extruded into bars or slabs.

The bars and slabs then go into the InFab room. Here they're heated and then forged or rolled to final shape. Bars, rods, sheet, and plate all can be rolled.

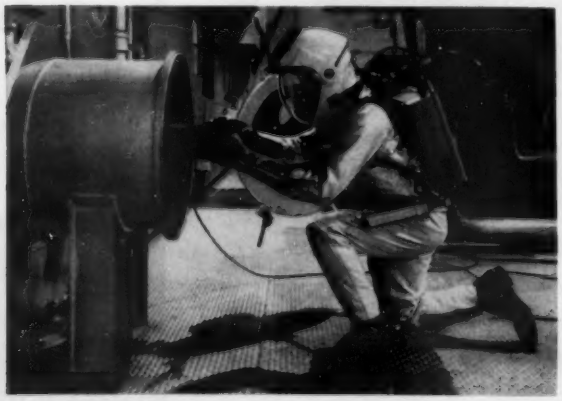
Because no oxides or nitrides are present to contaminate the metal, it is very ductile after hot rolling and is easily cold worked to any final shape desired.

All controls for the InFab room are outside. Still it's necessary to have workers in the room to take care of any emergencies which might arise. That's the reason for the men in the space suits shown in the illustrations. Each man carries a self contained oxygen pack which enables him to remain in the argon filled room for about 1½ hours. Through the use of a microphone in the helmet he can be in constant contact with the outside.

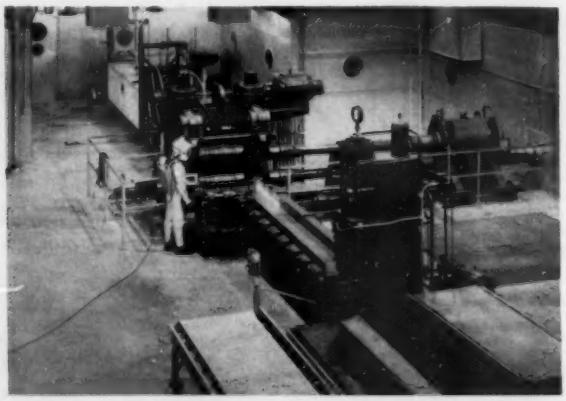
Men, material, and equipment enter and leave the room through specially designed air-locks so that the purity of the gas is never upset.

The room is 42' x 97' x 23' high. Its volume is 84,000 cubic feet. The atmosphere is constantly recirculated through a purifying system and is held at a positive pressure of ½ oz. per sq. in. above atmospheric pressure outside the room. Small amounts of argon are, of course, lost in the air-locks and through small leaks. Make-up gas is added in the purifier.

The entire InFab facility will be operated by the Universal-Cyclops Steel Corp. and was designed and installed in cooperation with the Department of the Navy, Bureau of Naval Weapons. While navy work will, naturally, have priority; the unit will be available for civilian use.



AN AIR LOCK allows introduction and removal of material without contamination of the atmosphere.



A SPECIALLY DESIGNED rolling mill is used. Instead of indexing the hot billets and rods, the roll stand is moved laterally.

For outstanding brightness, ductility, adhesion, and leveling:

LEVELMAX

BRIGHT NICKEL PROCESS

The new Levelmax process now assures a bright smooth nickel coating for poorly polished steel, dull copper plate, unbuffed stampings and castings. Simple to control and maintain, Levelmax can be used under standard plating conditions. It has a high tolerance to organic and metallic contamination. The process provides excellent leveling action. The resulting bright nickel surface accepts chrome readily. Highly ductile, Levelmax permits crimping and forming operations. Extremely high current densities are permissible with conventional or air agitation. Nickel coverage is provided in recesses without burning in high current density areas. The process meets the requirements of varied product shapes, base metals and applications, reducing or eliminating surface buffing and polishing, and bright plating hard-to-buff areas. To date, Levelmax is being used in hundreds of thousands of gallons of nickel solution. Write or call for complete working details, to Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, REctor 2-9500, or call your nearest Federated Sales Office.

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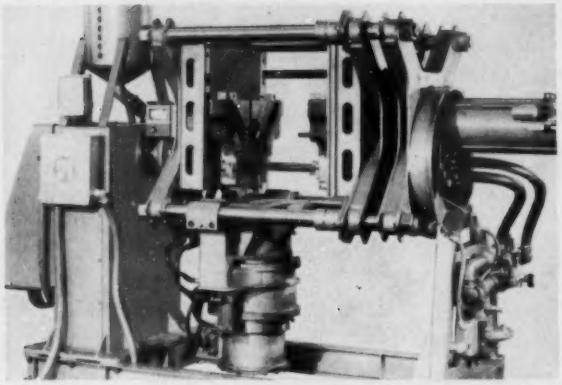
IN CANADA: Federated Metals Canada, Ltd.
Toronto, Ont., 1110 Birchmount Rd., Scarborough, Phone: Plymouth 73246

Montreal, P.Q., 1400 Norman St., Lachine, Phone: Melrose 7-3591

Circle No. 7 on Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards. You'll find them facing page 70 of this issue



SHELL CORE MACHINE

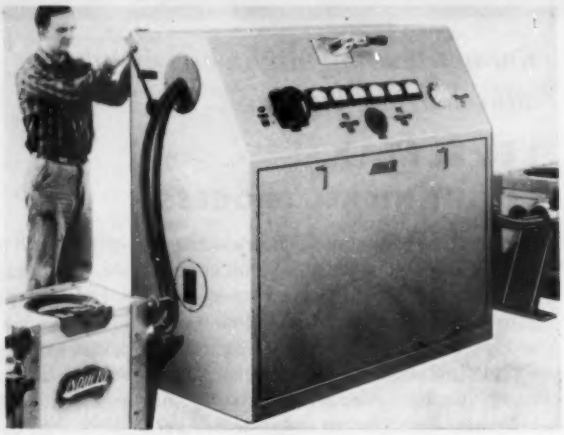
SPO INCORPORATED—The Model SC-100 shell core machine mass produces ready-to-use precision cores. The 100-lb. capacity unit features automatic, one-man operation and complete cycles of 90 seconds or less. All operations except the actual removal of finished cores are fully automatic and variable to meet individual requirements. All uncured sand is drained into the blow head for use in the next cycle. Simplified core box mountings permit fast, easy changes in size or type. Other features include automatic gravity sand feed, direct acting stripping mechanism, and automatic blow, dwell, drain and cure cycles.

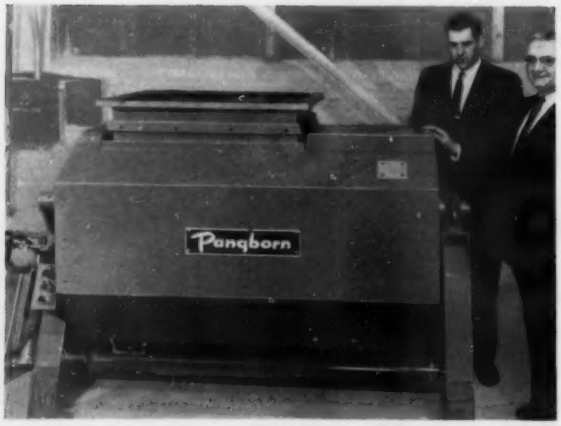
Circle No. 235 on Reader Service Card

INDUCTION MELTING AND HEATING UNIT IS SELF-CONTAINED

INDUCTOTHERM CORP.—The Integral 100 power and control unit for induction melting and heating is designed for maximum efficiency. The motor-generator powered, 100 kilowatt unit has an 8-step transformer and 30 steps of capacitance for maximum control flexibility. A compact console houses the power supply, capacitors, control and safety devices. Installation requires only a 60-cycle, 440 volt power connection, a cold water connection and a water drain. The self-contained unit is connected directly to two coils or furnaces by water cooled leads containing conductors inside the hoses.

Circle No. 236 on Reader Service Card



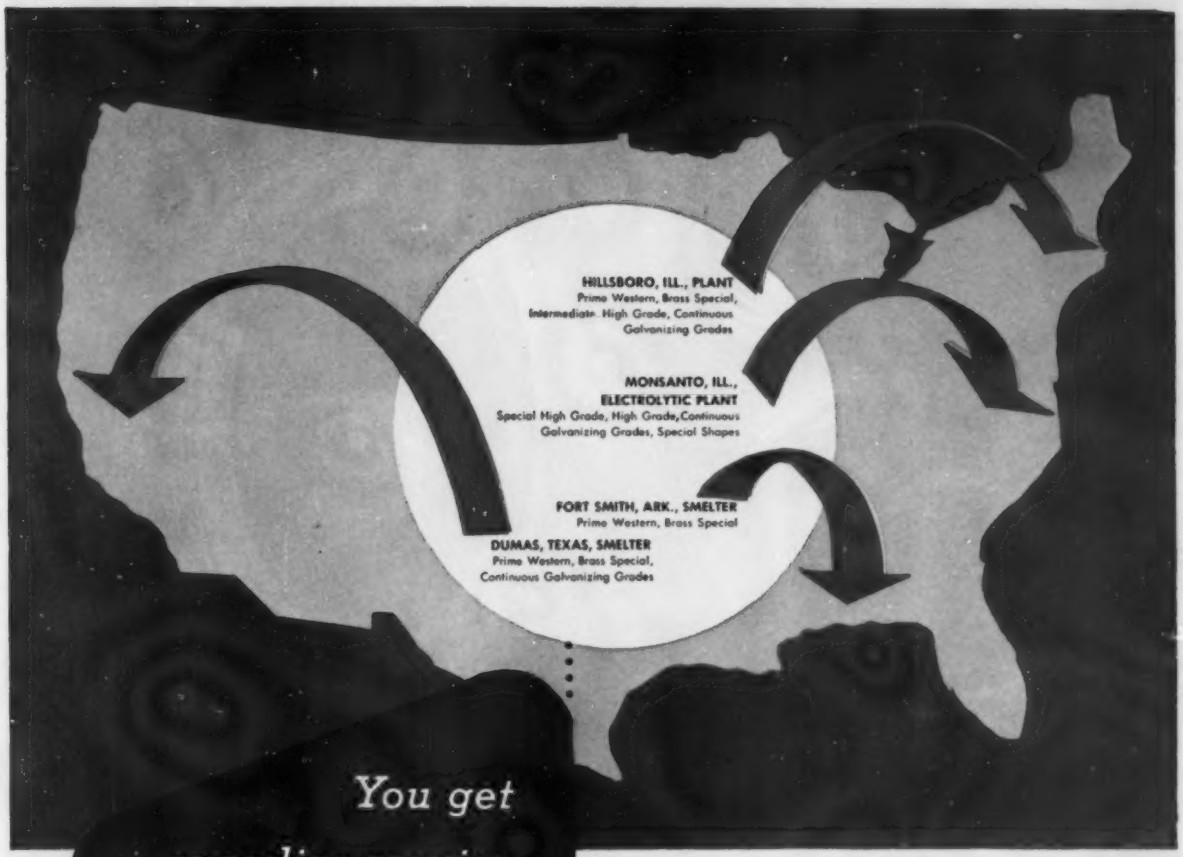


AIR INSULATES FINISHING MACHINE

PANGBORN CORP.—Four rubber air cushions insulate the work container of this vibratory finishing machine. Varying the air pressure in the cushions regulates the vibratory amplitude. The absence of floor vibration permits its use in buildings where structural limitations prohibit conventionally mounted machines. The unit is good for finishing fragile parts which are easily damaged in conventional equipment. Shielded areas can be reached with the proper selection of media. The machines can be used for the cleaning, descaling, deburring, radiusing, fine polishing, coloring and burnishing of nearly all metals.

Circle No. 237 on Reader Service Card

continued on page 62


HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
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Prime Western, Brass Special, Continuous Galvanizing Grades

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American Zinc sales Company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY

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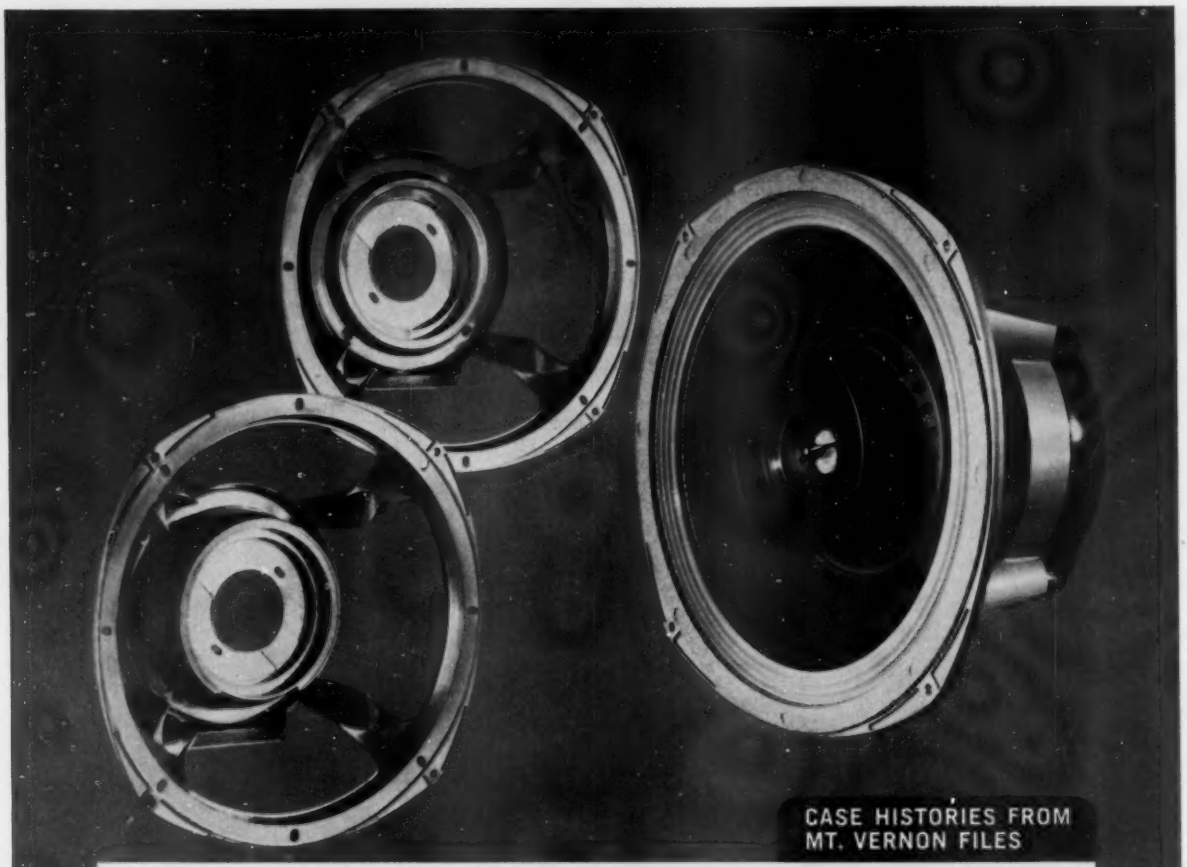


CASE HISTORIES FROM MT. VERNON FILES

From 1 Mt. Vernon Die... 2 Castings...7 University Speakers

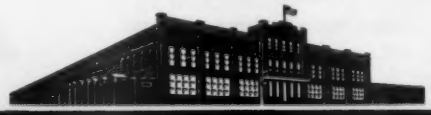
This University* Loud Speaker basket won first prize in the New Jersey Zinc Company "Lighter Than You Think" Die Casting Contest. It is one of two castings used to produce all seven new University wide range Series 200 speakers.

The basket weighs only 2 lbs. 12 ozs; measures 13" across corners; is 4⅝" deep and has a minimum wall thickness of .040". It is a one-piece, non-magnetic zinc casting that provides perfect rigidity for the entire structure assuring life-long stability and reliability. Furthermore, its narrow struts offer a minimum of reflecting surfaces, thus avoiding unwanted peaks and valleys in the frequency response of the speakers.

University engineers, thoroughly familiar with inherent advantages of die casting, design for maximum effectiveness of the art. The result ... an ingenious Mt. Vernon die with *interchangeable cores enabling them to cast two modified baskets from one die.* And because they have been working with Mt. Vernon for many many years, they dare to try the unconventional approach knowing full well that they can always depend on Mt. Vernon to follow through.

You may not be trying to win prizes ... just aiming for lower production costs. In that case we can show you how it can be done with die castings. Just call your nearest M.V. Sales Representative for quick action.

*University Loudspeakers, Inc., White Plains, N.Y.



MT. VERNON DIE CASTING CORPORATION
STAMFORD, CONNECTICUT

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BROOKLYN, N. Y.: Mr. Robert V. Moore, 2317 Plumb 2nd St.
CLEVELAND, OHIO: Mr. Grant Eller, 6 East 194th St.
GUILDERLAND, N. Y.: Mr. David H. King, 75 Willow St.
PITTSBURGH, PA.: Mr. Andrew W. Anderson, 300 Pasadena Drive So.
BRAINTREE, MASS.: Mr. E. W. Libby, 607 Washington St.
ROCHESTER, N. Y.: Mr. William Sauers, 101 Briarcliff Rd.
SKANEATELES, N. Y.: Mr. Jerome J. Theobald, 9 E. Genesee St.
STAMFORD, CONN.: Mr. Anker Anderson, Cascade Road
VALLEY FORGE, PA.: Mr. G. T. McMaster, P.O. Box 115

Circle No. 43 on Reader Service Card

BETHLEHEM CROMO-HIGH V TOOL STEEL

...ideal for casting in the 1200 to 1300 F range

If you are die casting aluminum-base or magnesium-base alloys at about 1200 F to 1300 F, you will find Bethlehem Cromo-High V tool steel (AISI H-13 type), one of the most economical choices you can make.

Cromo-High V is ideal for die casting in this temperature range because of its 5 pct-chrome, high-vanadium content. Cromo-High V is economical because it comes in the annealed condition to Brinell 207, and therefore is easy to machine. This die casting grade strongly resists the formation of a fine network of heat checks. Moreover, Cromo-High V develops uniform hardness in large sections during heat-treatment, enabling it to resist wash and erosion.

Typical Analysis

C	*Cr*	*V*	*Mo*	*Si*
0.40	*5.25*	*1.05*	*1.25*	*1.00*

Put Cromo-High V to work at your first opportunity. Your local Bethlehem tool steel distributor will be pleased to work closely with you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Circle No. 69 on Reader Service Card

Detroit
JOrdan 6-4767

Toronto
Ajax 1395

Cleveland
ACademy 1-6440

Chicago
COlumbus 1-7199

Youngstown
STerling 8-9661

Seattle
MUtual 1997

Cincinnati
TRinity 1-2520
and
EAst 1-8844

San Francisco
JUno 9-3050

we like to be close
to our customers

Erie
GLendale 5-9604

Los Angeles
LUdlow 9-3453
and
ANgeles 9-7304

New Haven
MAine 4-2375

Denver
BElmont 3-2333

and future customers!

Philadelphia
GArfield 6-6520

Houston
PArkview 3-3521

Atlanta
TRinity 5-8196
and
CEdar 3-2361

Nashville
CYpress 2-7016

Trenton
OWen 5-6205

Whether you want information on an application, or service on an existing installation, the Ajax Magnethermic man can give you assistance. He knows induction heating and melting.

induction heating is our only business!

Ajax Magnethermic CORPORATION

GENERAL OFFICES..... P. O. BOX 639 Youngstown 1, Ohio

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YOUNGSTOWN DIVISION... 3990 Simon Road Youngstown 1, Ohio

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THE BONNELL TO SUCCESSFUL ALUMINUM EXTRUSIONS...

The Symbol of Distinction

BON L

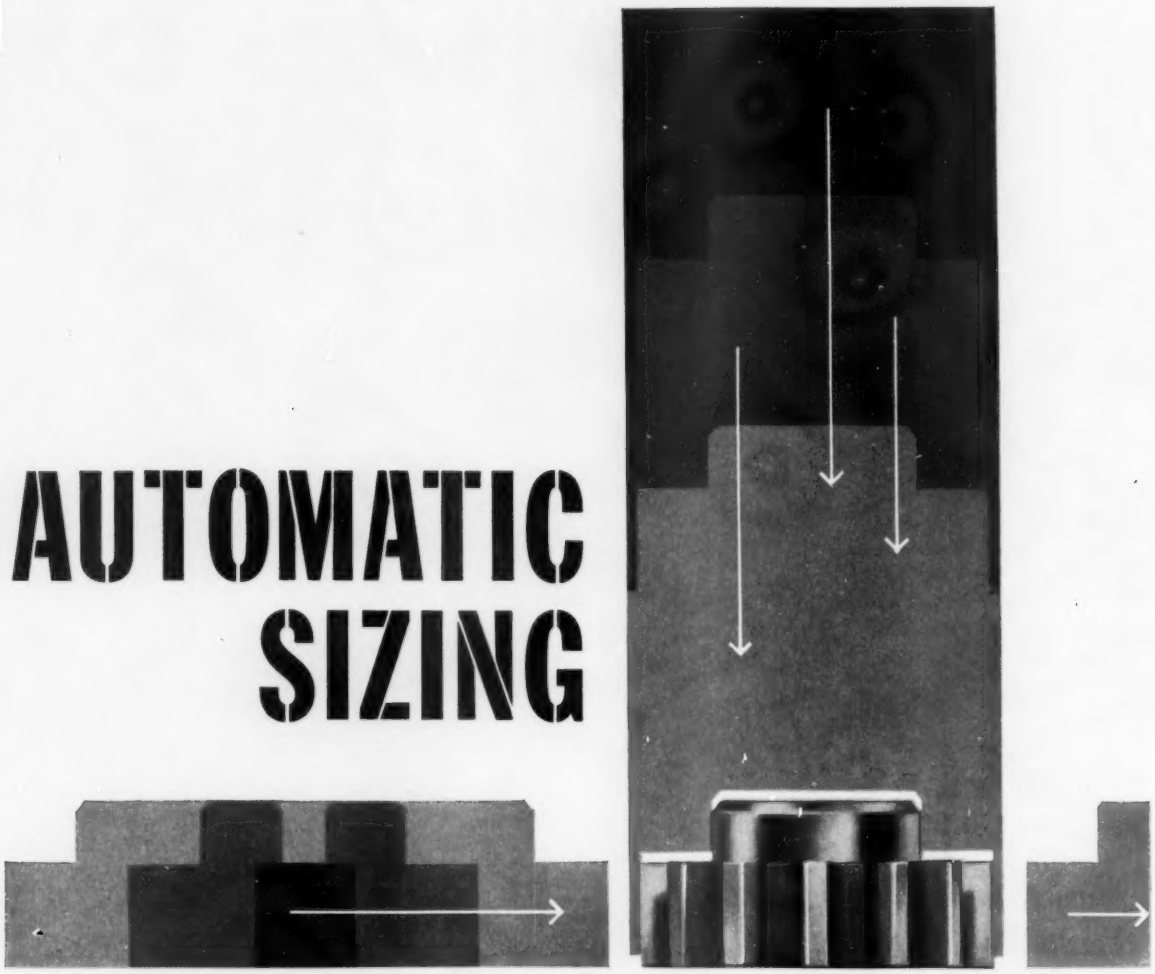
THE WILLIAM L BONNELL COMPANY, INC.

NEWNAN, GEORGIA

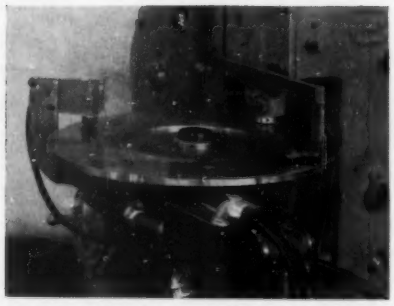
Phone or Wire Collect for the Address of our nearest District Sales Office

WE NEVER COMPETE WITH OUR CUSTOMERS

AUTOMATIC SIZING



speeds production of powder metal parts



The photo illustrates a modified Stokes compacting press, Model T-4, equipped with a special holding and feeding fixture for automatic sizing. This type of rotating fixture has proved highly successful in sizing small, complex parts.

Stokes brings new thinking, new designs to high-speed sizing of powder metal parts. With speed, accuracy, and minimum tool wear as design objectives, Stokes has modified many of its standard compacting presses for automatic high-speed sizing. The Stokes presses now in service are sizing a wide variety of powder metal shapes at high production speeds . . . and they are easily converted to operate either as sizing or compacting presses.

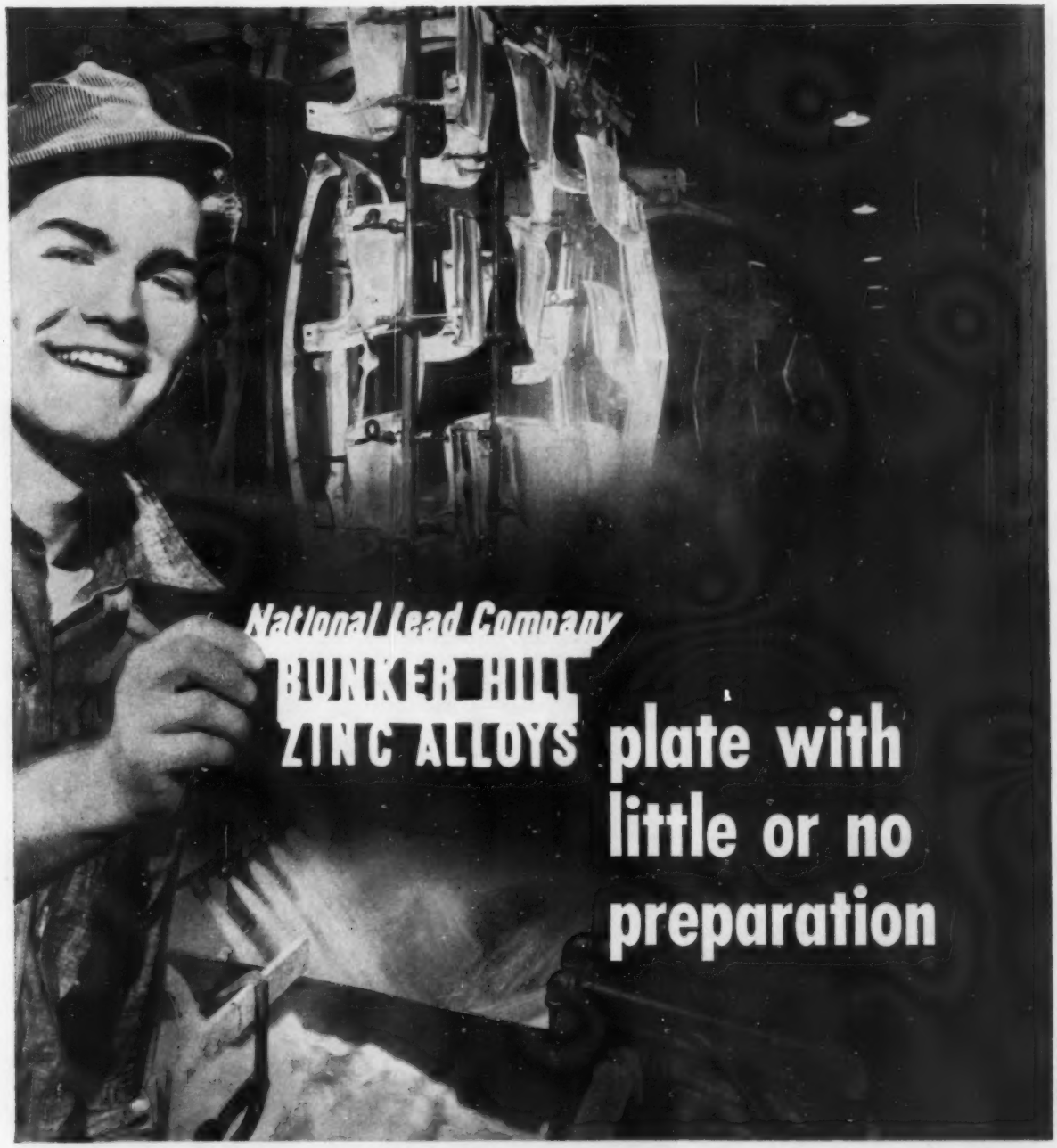
For special applications, Stokes offers such production-oriented design considerations as automatic feeders, orientation and inspection devices, and other innovations. It is this kind of advanced thinking that can keep you ahead of rising production costs . . . can help you plan for your future needs.

Consult Stokes Engineering Advisory Service on your specific powder metal application. You'll get professional assistance in designing parts, punches and dies, or complete production facilities. Technical information on the complete Stokes line of compacting presses is available on request.

STOKES

POWDER METAL PRESS DIVISION • **F. J. STOKES CORPORATION** • 5500 TABOR ROAD, PHILADELPHIA 20, PA.

Circle No. 53 on Reader Service Card



The as-cast finish you get from ***National Lead*** Bunker Hill Zinc Alloys is ready for plating. Any preparation—if required—is small and simple.

The basic reason is simple, too: extreme purity. ***National Lead*** Bunker Hill Zinc Alloys exceed ASTM and SAE specifications for freedom from contaminants. You get sound, high-strength castings—unmarred by porosity—that require very little machining. They fabricate neatly and economically ... whether trimmed, punched, tapped or broached ... help you maintain fast, economical production on all machines.

Get full value—from forming to finishing—by starting with ***National Lead Company*** Bunker Hill Zinc Alloys... respected everywhere for their ability to speed production, minimize rejects. When you need them, simply call us.

National Lead Company

General Offices: 111 Broadway, New York 6, N. Y.
Offices in principal cities

Circle No. 44 on Reader Service Card

TODAY AND TOMORROW

whatever may be your problems

BUNTING®

BEARINGS *Supply the answers*

...Cast Bronze Alloys...Powdered Sintered Metals...Bearing Aluminum Alloys

Why pay more for a bearing or part than you have to? Let Bunting help you get your requirements down on the lowest cost level compatible with adequate performance.

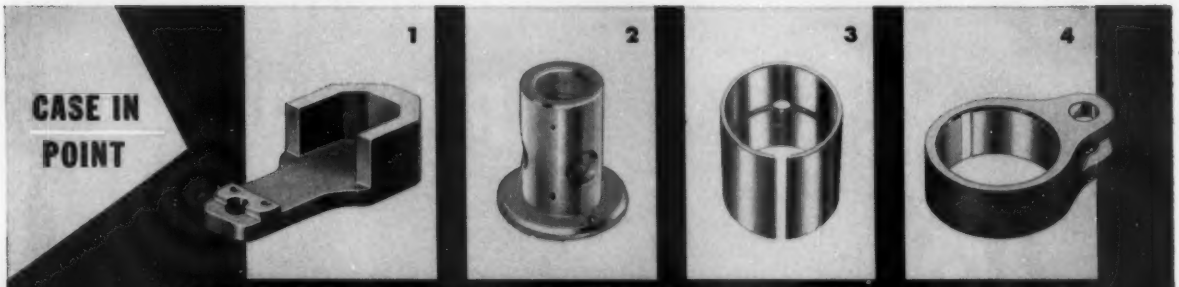
Today and tomorrow "the best" bearing means one that will do the job at the lowest possible cost. Let Bunting help you find the best bearing.

Bunting offers a highly competent designing, engineering and manufacturing facility operating in the field of bearings and special parts.

All modern proven materials are available, others are under study. Two plants with advanced equipment—of our own design—assure absolute production control and lowest manufacturing cost.

Let us re-examine your current bearing applications, or work with you on new requirements. Send in your prints for study and pricing. No cost nor obligation.

CASE IN POINT



1 The great and diverse cost advantages of powder metallurgy are revealed in the highly complex nature of this bearing support plate for power tools made in Bunting's Powdered Sintered Metals Plant.

2 An Aluminum Alloy helped cut the cost of this high speed turbo super charger bearing with its intricate machining of many dimensions and close tolerances.

3 Bunting exclusive methods and equipment reduced to the minimum the cost of this cast bronze spindle bearing with its extremely rigid specifications.

4 This connecting rod demands a fine profilometer reading on the finish of the bores in the two holes, axes of which must be parallel to each other within extremely close limits. Bunting makes such high precision work feasible cost-wise.

MACHINING SERVICE: Emergency service machine shops in Bunting Branches are there to render immediate low cost service on bearings or parts needed for experiment or maintenance. Your local Bunting Distributor can arrange for such service.

Write for these:

No. 46—TECHNOLOGY OF BUNTING BEARING ALUMINUM—A technical treatise on the composition and machining of Bearing Aluminum Bar Stock.

No. 1 . . . ENGINEERING HANDBOOK OF POWDER METALLURGY—A comprehensive technical treatment of engineering and manufacturing of sintered metals, bearings and parts.

No. 158—GENERAL CATALOG—Complete listings of Cast Bronze and Sintered Bronze Stock Bearings and Bars and Bunting Bearing Aluminum Bars available from stocks of local distributors all over America.

THE BUNTING Brass and Bronze Company · Toledo 1, Ohio · Phone EVergreen 2-3451

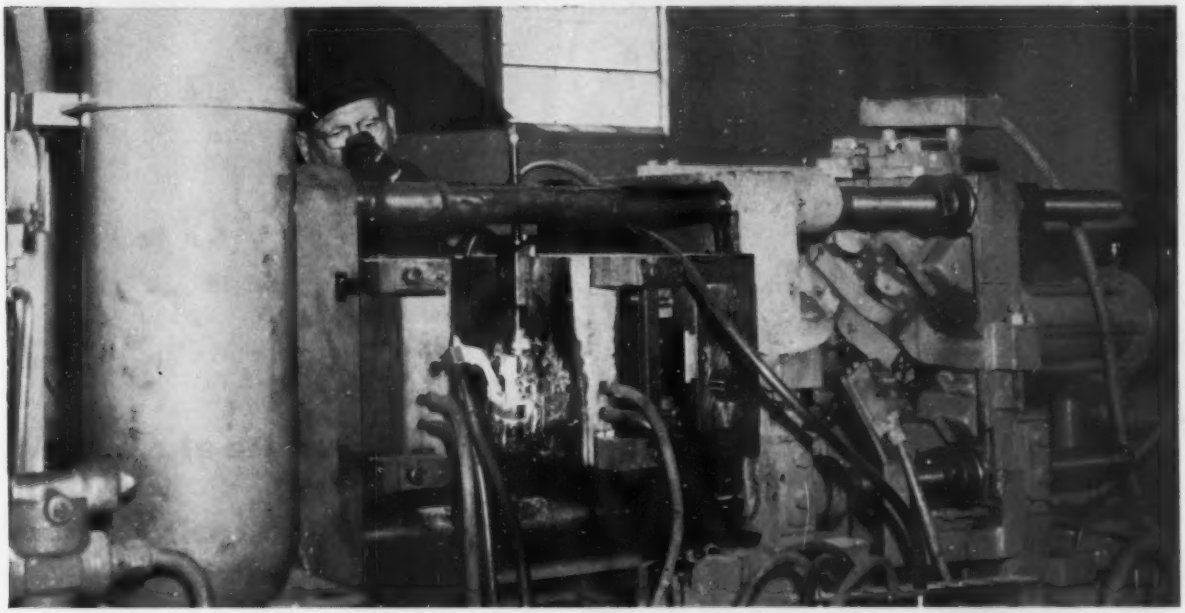
BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

Circle No. 15 on Reader Service Card

SAVE ON SHORT RUN DIE CASTINGS!

CHANGE DIES IN MINUTES!

With D-M-E Standard Unit Dies for Zinc or Aluminum Die Casting



Cut Die Costs and Save Time with Stock Replacement Units

DIE CHANGES that normally take 3 to 5 hours are done in minutes with D-M-E's Standard Unit Dies for zinc or aluminum die casting.

Standard interchangeable Replacement Units are *in stock* now to reduce your die costs and shorten delivery schedules.

D-M-E's Standard Unit Die assembly offers these unique features for added savings in production time and maintenance:

Construction permits complete freedom on *three sides* of the cavity for placement of cores or cooling lines; six sturdy leader pins and bushings provide accurate alignment and trouble-free performance; and "quick change" wedge clamps for positive positioning of each plate.

Standard Replacement Units are quickly positioned in the Unit Die Holder by a precision T-slot in the mating edge of the plates; there is no interference with the cavity layout.

Whether you require rack and pinion or automatic "bumper-type" ejection, D-M-E has a Standard Unit Die to fit the machine.

D-M-E Unit Die Holders are available for Standard 10″ x 12″ or 12″ x 15″ Replacement Units.

Start saving *now* on your short-run die-casting jobs with D-M-E Standard Unit Dies.

SEVEN BRANCHES FOR FASTER SERVICE

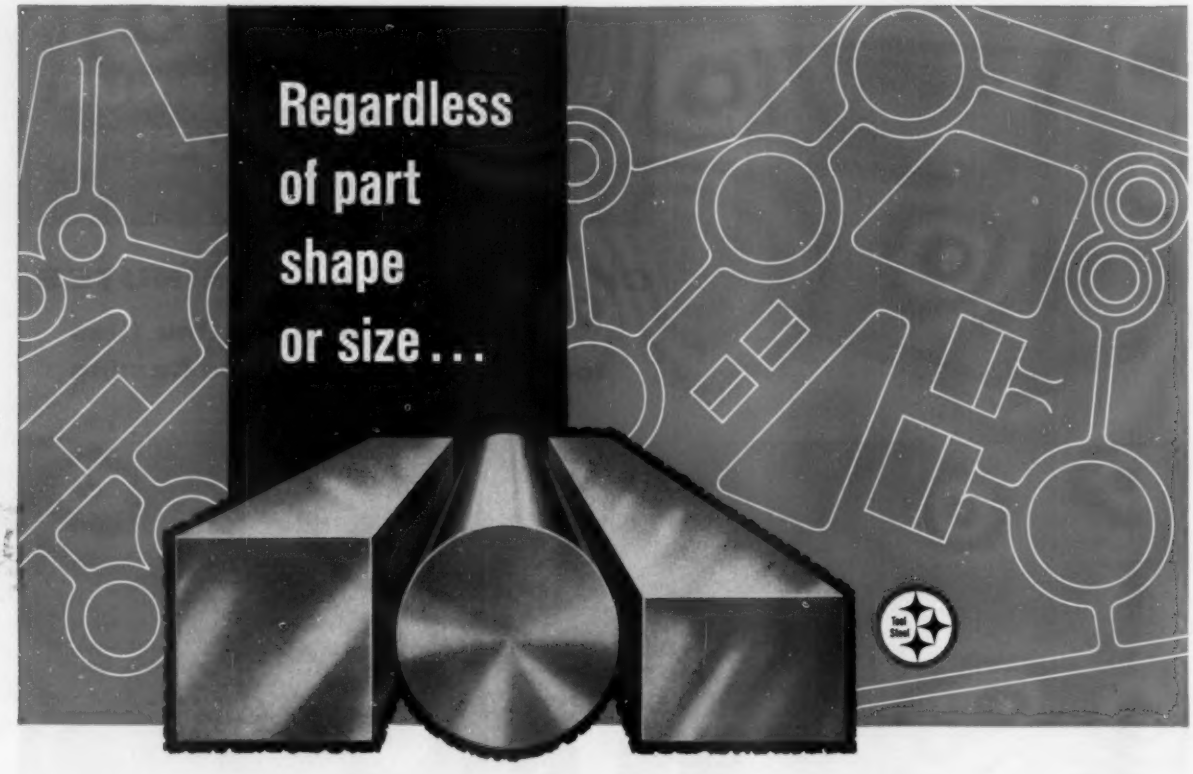
Write **TODAY** for Complete Specifications

DETROIT MOLD ENGINEERING COMPANY

DME

- DETROIT: 6686 E. McNichols Rd.—CHICAGO: 5901 W. Division St. HILLSIDE, N.J.: 1217 Central Ave.—LOS ANGELES: 3700 S. Main St.
- D-M-E CORP., CLEVELAND: 502 Brookpark Rd.—DAYTON: 558 Leo St.
- D-M-E of CANADA, Inc., TORONTO, ONT.: 156 Norseman Ave.

Circle No. 22 on Reader Service Card



Dependable . . . VDC hot work die steel means *Better* die casting dies

Send today for VDC data sheet

Part shape or size presents no problem when you use Latrobe's VDC (Type H-13) hot work die steel. Easy to machine, VDC possesses excellent non-deforming characteristics and can be uniformly hardened to give ultimate resistance to wash and erosion when in service. In addition, the high vanadium content in VDC makes it ideal for magnesium or aluminum alloy die casting service in temperature ranges up to 1200°F.

Other advantages of VDC include sound internal structures guaranteed by Reflectoscope inspection . . . freedom from porosity . . . superior impact strength . . . and a wide range of stock sizes located at nearby Latrobe Steel Service Centers for immediate delivery.

Call your Latrobe representative . . . specify VDC for *your* next die casting die.

Manufactured by skilled American labor.

LATROBE
Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

Circle No. 37 on Reader Service Card

Designing Excess Labor Out of your product with MADISON-KIPP zinc and aluminum die castings

In the DOLE VALVE COMPANY'S AUTOMOTIVE VACUUM SERVO CONTROL HEAD the intricate shape, the tubes, the gasket grooves and holes are all cast to size.

This is a prime example of maximum utilization of the die casting process.

The skilled and cost-conscious mechanics at Madison-Kipp worked closely with the valve designer to create a component of excellence and low secondary labor content.

Please clip this ad as a reminder to contact us when you have die casting requirements.

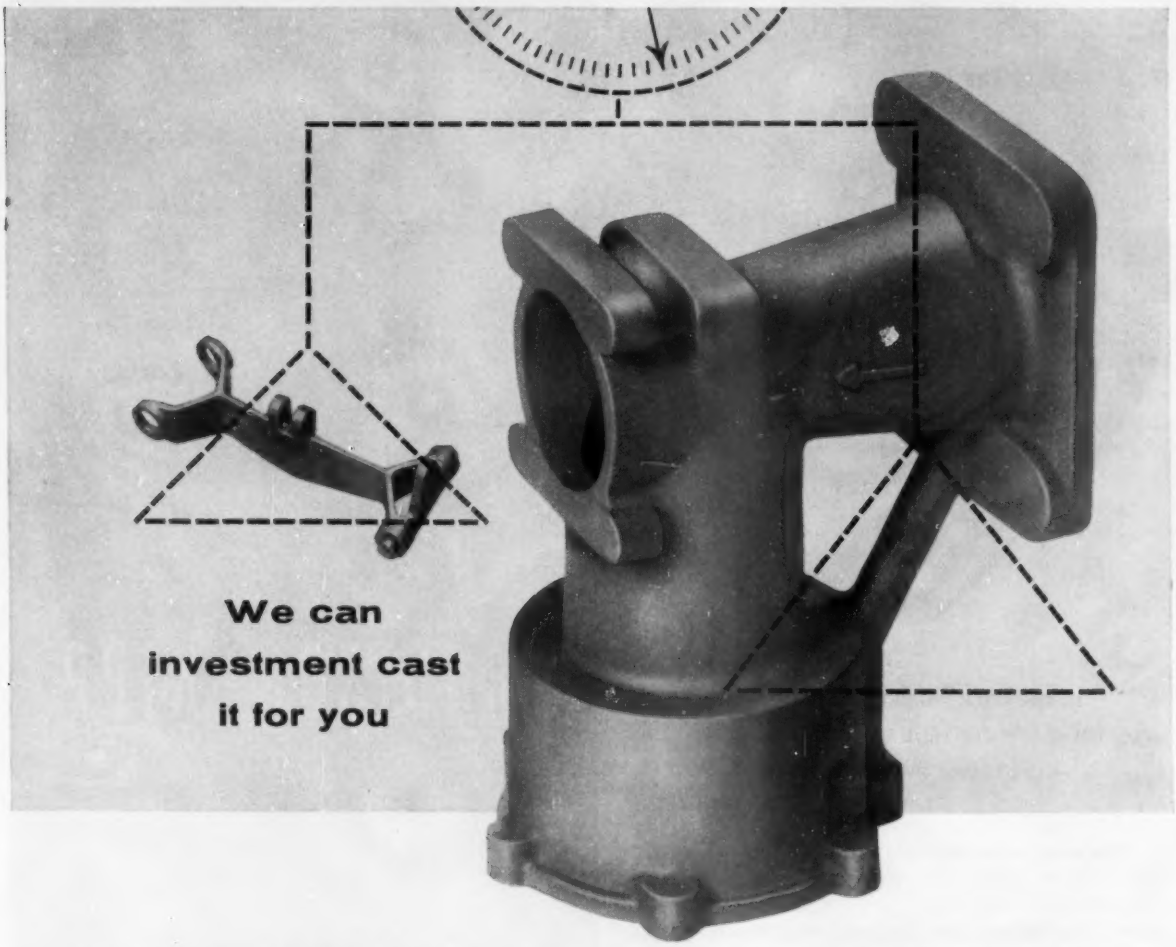
MADISON-KIPP CORPORATION
213 WAUBESA STREET · MADISON 10, WISCONSIN U.S.A.

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools

kipp

Circle No. 40 on Reader Service Card

WHETHER YOUR PART IS TINY... OR WEIGHS 100 POUNDS...



Today, no matter how large the part on your drawing board . . . whether it weighs a few ounces or as much as 100 pounds . . . Arwood can investment cast it. It makes no difference what the metal or alloy is. We cast all castable materials, ferrous and non-ferrous, including magnesium. So now you can reap the benefits of investment casting in the broadest range of part sizes, weights and materials ever. Benefits like freedom to specify the best possible metal for the job . . . sharply reduced production costs on complex shapes . . . quick, inexpensive tooling in design development work.

Add to these the advantage of having a single casting source for *all* your investment cast parts, both large and small.

Our five foundries can give you the metal you need, the shape you need, and the quantity you need, from a few design prototypes to many thousands.

Write for your free copy of our 44-page booklet, "Practical Guide to Investment Casting."

Machine the simple . . . cast the complex

A complete service from design through tooling, production and finish machining. Seventy-one engineering representatives from coast to coast.

arwood

ARWOOD CORPORATION • 323 West 44th Street, New York 36, New York

PLANTS IN BROOKLYN, N. Y.; TILTON, N. H.; GROTON, CONN.; LOS ANGELES AND LA VERNE, CALIF.

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TRIULZI

SERIES:
castmatic

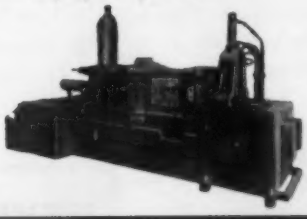
Automatic Control with pre-selecting panel for arranging up to 8 different working programs

VICKERS HYDRAULIC EQUIPMENT

SIEMENS ELECTRICAL EQUIPMENT

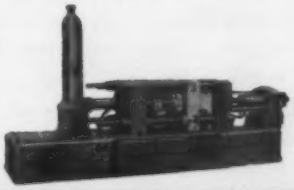
Model CASTMATIC Z/250
hot chamber type

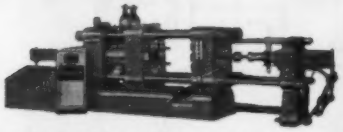
- Wedge Lock clamping system
- 275 short tons locking force
- 13.2 lbs. Zinc, max. casting weight
- 600 dry cycles per hour



Model CASTMATIC 150
cold chamber type

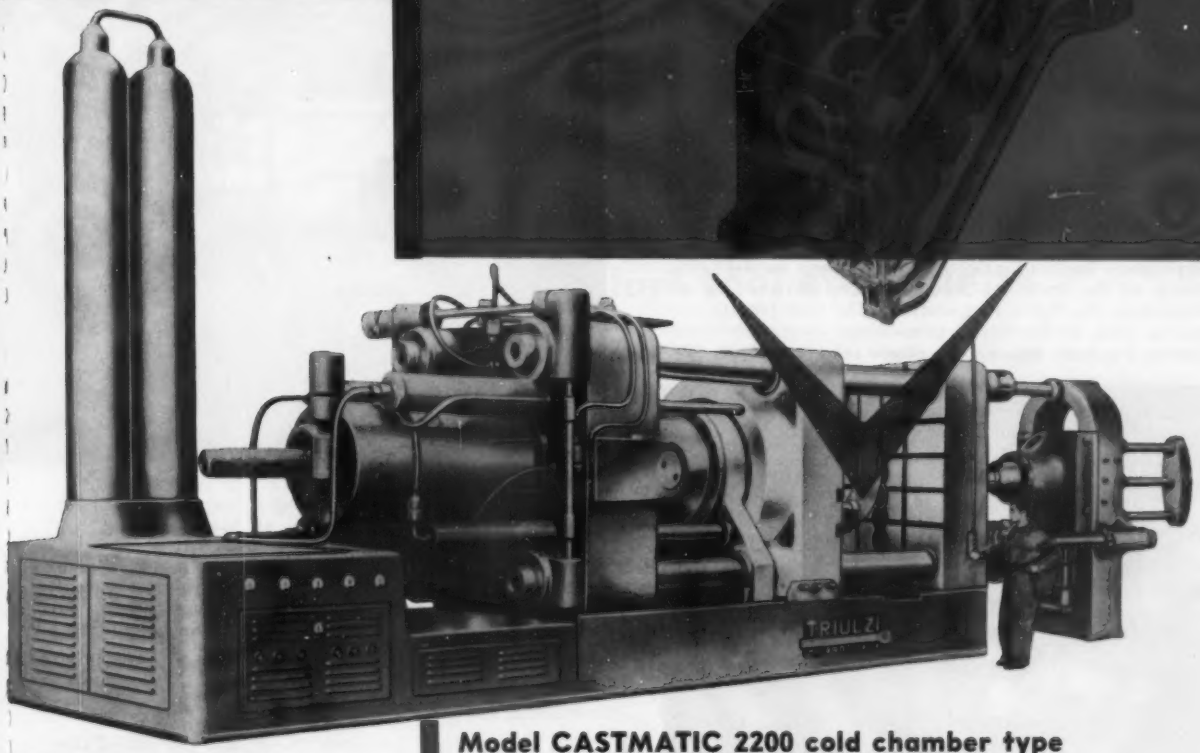
- Toggle clamping system
- 165 short tons locking force
- 5.5 lbs. Copper, max. casting weight
- 1100 dry cycles per hour





Model CASTMATIC 600
cold chamber type

- Wedge clamping system
- Central screw for adjusting platen daylight
- 660 short tons locking force
- 33 lbs. Copper, max. casting weight
- 240 dry cycles per hour



Model CASTMATIC 2200 cold chamber type

- Locked piston positive clamping system
- 2500 short tons locking force
- 110 lbs. Aluminum, max. casting weight
- 98 1/2" max. open platen daylight
- 59" moving platen stroke
- 72 4/5" x 76 3/4" platen dimensions

ALL TRIULZI MACHINES can be supplied with:

- Vacuum Equipment
- Automatic ladling

Circle No. 72 on Reader Service Card

From cradle to dry hearth, Hevi-Duty provides the right melting furnace for your job

Yes, Hevi-Duty can provide the furnace you need. It's probably a standard unit, for at Hevi-Duty you have a wide choice of sizes and types. If not, though, you've *still* come to the right place.

Hevi-Duty is a company of engineers, trained to solve heat processing problems and to design special equipment to meet your requirements. When you ask to see a Hevi-Duty representative, a man with application engineering experience will call on you. You can depend on him to recommend the most efficient system as well as the best furnace or oven for you.

So why not call on him. He will be glad to stop in, and you could be very glad he did.

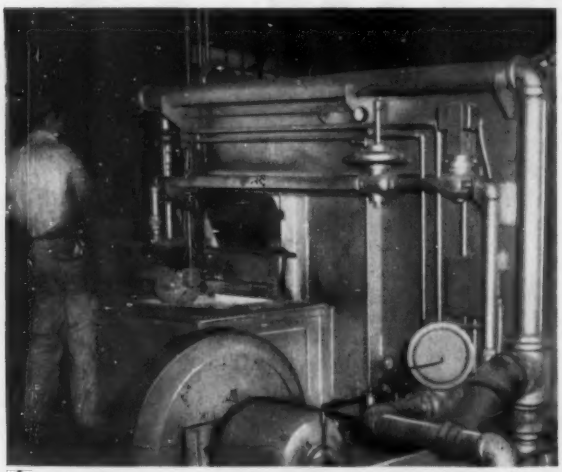
HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.



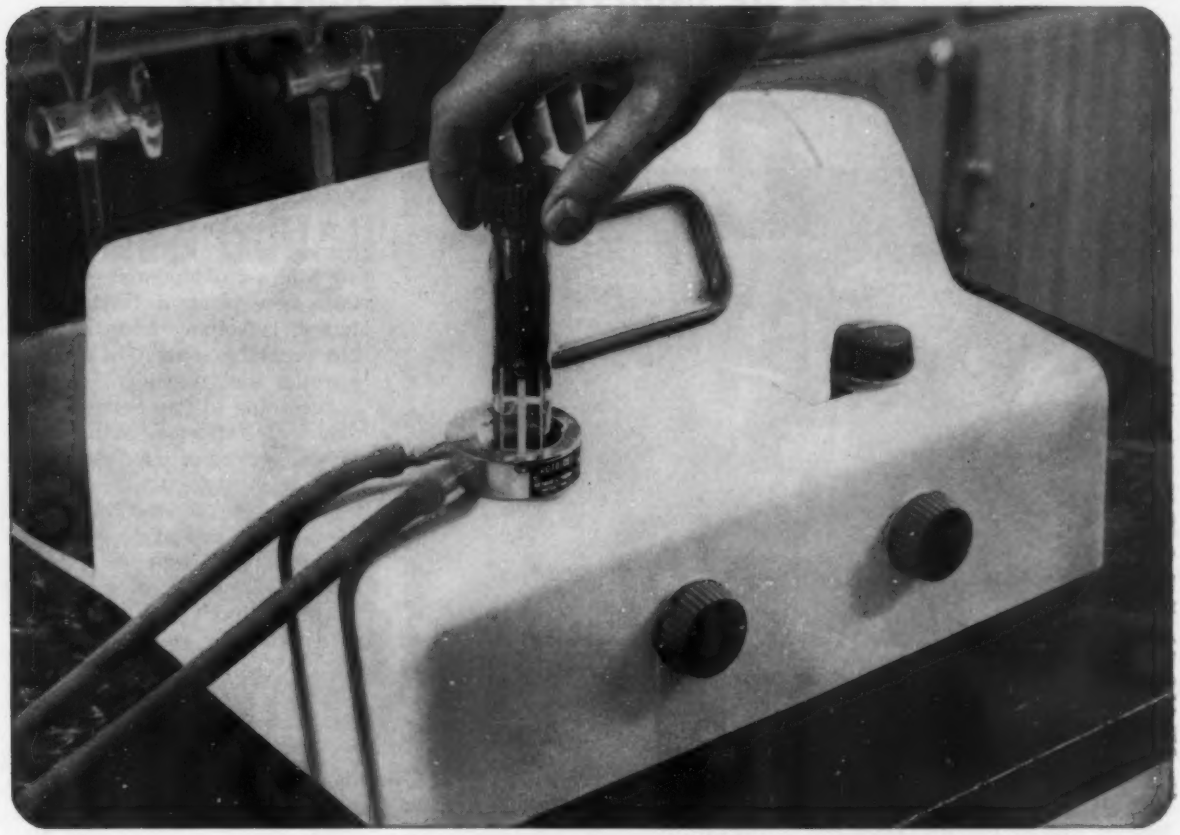
This double chamber dry hearth furnace was tailored to the specific needs of Eastern Castings Corporation, Newburgh, N. Y. It is used for permanent mold aluminum casting at temperatures up to 1550°F. For this high-temperature application, structural steel was moved to the outside of the shell and insulation was increased to accommodate the higher temperature. The user reports continuous, high production at tremendous savings on maintenance. ***For more information, please send for Bulletin 594.***

This dry hearth melting and holding furnace is used for many different aluminum alloys at Manufacturing Research, International Harvester Company. It is gas fired, has a melting rate of 750 pounds per hour and a holding capacity of 1,000 pounds. The pit beneath the pouring spout enables the company to pour castings as large as the holding capacity of the furnace. ***Request Bulletin 594.***

Dollin Corporation, Irvington, N. J., has purchased this cradle tilting reverberatory furnace for breaking down and holding aluminum. It handles a larger volume of metal at lower cost than the furnaces it has replaced. There is also a better balance of heat, resulting in cleaner metal. Working conditions are cooler near the unit, and its design provides for easy drossing. ***Please write for Bulletin 691.***

Circle No. 29 on Reader Service Card

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact* analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

WSW-7262

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Bldg., Pittsburgh 22, Pa. Address Dept. PM-7

ALLEGHENY LUDLUM

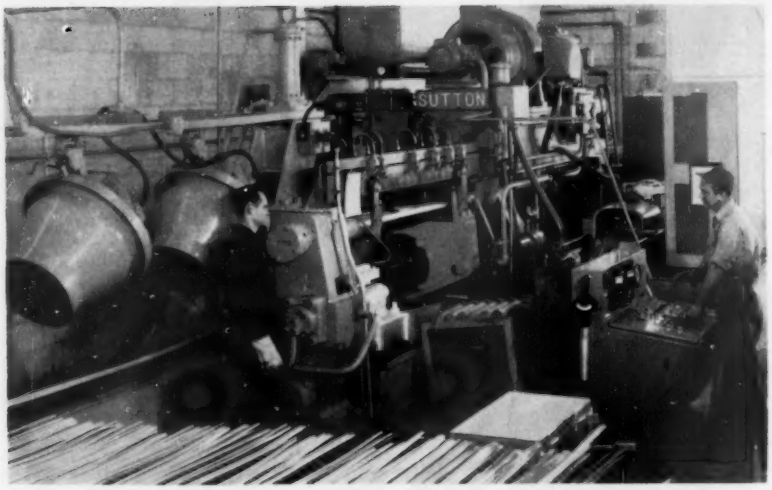
Tool Steel warehouse stocks throughout the country... Check the yellow pages

every grade of tool steel... every help in using it

Circle No. 3 on Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries



NEW EXTRUSION PRESS INCREASES PRODUCTION 30%

A 625-ton Sutton aluminum extrusion press, installed last year at Mideast Aluminum Corporation's new plant at Dayton, New Jersey, is helping to make possible profitable operation for both extruder and customer.

According to Ray Sowers, president of Mideast Aluminum, "Speed cycling of our Sutton press increases production while the high pressure exerted on the die permits extrusion at the bottom of the metallurgical temperature range for superior finish. At least 30% more production than anticipated has been realized."

SDCE ANNOUNCES PROGRAM

The Society of Die Casting Engineers has selected subjects and named program chairmen and session leaders for the Technical Congress to be held in conjunction with the First National Die Casting Exposition and Congress to be held in the Detroit Artillery Armory from November 8-11, 1960.

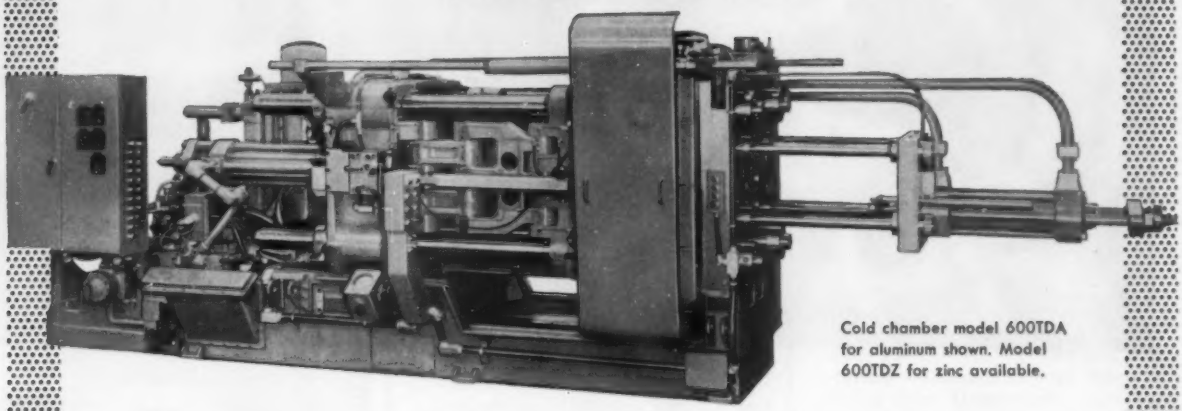
The Technical Congress will include eight separate sessions. One session will be held from 9:30 A.M. to 12:00 noon and the other from 1:30 P.M. to 4:00 P.M. in the Artillery Armory on each of the four days of the Exposition. Each of the sessions will have a minimum of three technical papers and/or panel discussions.

The subjects selected for the sessions have been based on a recent SDCE industry survey of specific interests in the die casting field. This survey revealed an extremely high interest in the areas of die design and vacuum die casting. Other subjects in which die casting engineers showed great interest were: Anodizable die castings, die steels, die casting equipment, finishing of die castings, lubricants, automation, quality control, and die casting alloys.

more industry news page 64

Subject	*Program Dir. & Session Leaders*	*Date*	*Time*
Die Design	Dir: Earl Mason, Consultants to Industry, Inc. Session Leader: John Caster, Consultants to Industry	Tuesday Nov. 8, 1960	9:30 A.M. to 12: Noon
Die Building	Dir: Earl Mason, Consultant to Industry Leader: John Atols, Atols Tool & Die Co.	Tuesday Nov. 8, 1960	1:30 P.M. to 4:00 P.M.
Metallurgical Developments	Dir: Don Colwell, Apex Smelting Company Leader: Wm. Foss, Apex Smelting Company	Wednesday Nov. 9, 1960	9:30 A.M. to 12: Noon
What's Ahead In Die Castg.	Dir: Don Colwell, Apex Smelting Company Leader: John Wall, Permanent Mold Die Co.	Wednesday Nov. 9, 1960	1:30 P.M. to 4:00 P.M.
Competition to Die Casting	Dir: Peter Ponta, Ford Mtr. Leader: Earl Hovey, Earl Hovey Associates	Thursday Nov. 10, 1960	9:30 A.M. to 12: Noon
Cost and Profit	Dir: Peter Ponta, Ford Mtr. Leader: J. T. O'Reilly, Ford Motor Co.	Thursday Nov. 10, 1960	1:30 P.M. to 4:00 P.M.
Quality Control	Dir: William Durako, Crucible Steel Co. of America Leader: Clarence Tice, Delco Remy Div., GMC	Friday Nov. 11, 1960	9:30 A.M. to 12: Noon
Vacuum Die Casting	Dir: William Durako, Curcible Steel Co. of America Leader: David Morgenstern, Nelmor Mfg. Co.	Friday Nov. 11, 1960	1:30 P.M. to 4:00 P.M.

New 600-Ton REED Die Caster



Cold chamber model 600TDA for aluminum shown. Model 600TDZ for zinc available.

The all new REED 600 TD, designed for both cold and hot chamber die casting

Reed-Prentice has designed a new 600-ton die caster that will produce the highest quality magnesium, aluminum and zinc castings possible. Available for both cold chamber and hot chamber die casting, the 600-ton REED has 47″ x 46½″ die plates; 28½″ x 28½″ clearance between tie bars; a tie bar diameter of 5½″; and a strain gauge tested locking pressure of 600 tons. Other design and operating features for rugged, efficient, and dependable die casting include:

- Die Stroke adjustable over 6″ of initial stroke, providing an adjustable stroke of 12½″ to 18½″.
- Shot stroke cylinder is adjustable from 14″ to 20″ in order to accommodate different length sleeves.
- Tie bar adjustment is accomplished by use of one retained graduated tie bar nut.
- Tie bars may be pulled or moved forward by hydraulic power using a cam way lock device.
- Electric and hydraulic circuits provide for any type operation.

Ask your REED Sales Engineer today for all the facts about the Reed-Prentice 600 TD and the full line of REED die casting machines.

REED-PRENTICE

division of

EAST LONGMEADOW, MASSACHUSETTS

PACKAGE MACHINERY COMPANY

BRANCH OFFICES: BUFFALO • CHICAGO • CLEVELAND • DEARBORN • KANSAS CITY • LOS ANGELES • NEW YORK

Circle No. 48 on Reader Service Card

My answer for fire-resistant fluids is... UCON Hydrolubes

Q. WHAT FLUID GIVES YOU EASY CONVERSION, GOOD PROTECTION, AND LOW LOSS?

Most hydraulic systems can be quickly and easily converted to fire-resistant UCON hydrolubes. Actual experience, in hundreds of industrial installations, shows that standard flushing and refilling procedures, involving a minimum of time and effort are sufficient.

The procedure generally followed in converting to a UCON hydrolube fluid from petroleum fluids is:

- Drain oil; remove sludge, deposits, and reservoir paint if affected by UCON hydrolubes.
- Flush with UCON hydrolube.
- Install a clean filter and replace worn parts. Repair leaking pipe joints.
- Operate at reduced pressure to insure proper lubrication of the hydraulic pump; then bring the system up to standard operating conditions.

No special packings and seals are required.

The same procedure is followed in replacing non-aqueous, fire-resistant fluids with UCON hydrolubes. But, all the old fluid must be first removed by flushing with petroleum hydraulic oil.

And, once installed, UCON hydrolubes have low loss.

UCON hydrolubes are the economical answer for fire-resistance in hydraulic fluids. Extensive field tests and more than 10 years of routine use in industrial hydraulic equipment prove this. UCON hydrolubes are approved for use by Factory Mutual Laboratories.

Get all the facts on UCON hydrolubes. Read the booklet, "UCON Hydrolubes Spell Safety." For your copy, ask a CARBIDE Technical Representative or write Union Carbide Chemicals Company, Division of Union Carbide Corporation, Department J3, 270 Park Avenue, New York 17, N.Y.

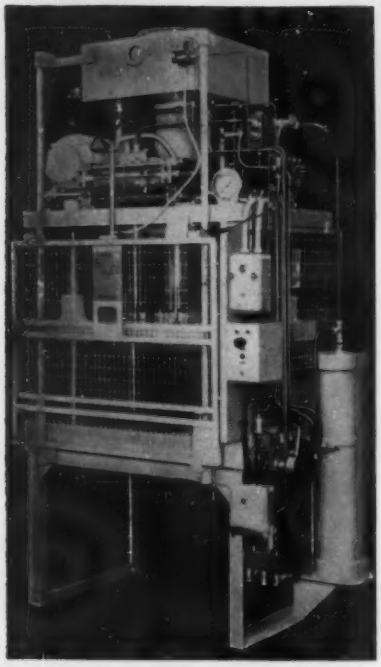
UNION CARBIDE and UCON are registered trade marks.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

Circle No. 55 on Reader Service Card

NEW BIPEL FAST-CYCLE HYDRAULIC CLIPPING PRESS



A brand new 34-ton clipping press from BIPEL... world renowned for their plastic molding presses! This special purpose hydraulic unit offers a faster approach (600 ins./min.), and a fast advance through the work (40 ins./min.), at full tonnage. Dry Cycle Time only 3 seconds. Semi-automatic or manual control... with mesh guards for maximum operator safety. A flexible, efficient, clean-trimming unit.

Write for Full Information

B.I.P. Engineering Ltd., Sutton Coldfield, England

RALPH B. SYMONS ASSOCIATES, INC.
3569 MAIN ROAD, TIVERTON, R. I.

BIPEL®

Circle No. 16 on Reader Service Card

LETTERS

the readers' forum

FINISHING CASTINGS

We wonder if any of your readers are in a position to give us information on the finishing of aluminum castings.

We produce a large variety of sand cast aluminum castings which we would like to produce with a satin finish.

At the present time, we are laboriously polishing and wire brushing these castings and we are interested in determining whether there is another method, such as perhaps tumbling or a chemical bath.

Any information you can give us about this will be appreciated.—D.R.S.

Barrel finishing is probably the best solution to this problem. Present barrel designs are so flexible that parts of almost any size can be automatically processed.

Another good possibility is one of the newer "blasting" processes; either air blast or airless blast. Several companies manufacture fully-automatic equipment to process parts by these methods.

Depending on the finish desired, it might be that automatic buffing and/or polishing would be a possible answer also. Here, again, several manufacturers have equipment which is fully automatic.

As far as chemical treatment is concerned, it is rather doubtful if any of the etching methods will do a satisfactory job. Almost all chemical attack processes remove metal uniformly over the entire exposed surface. Masking-off areas not to be attacked is possible, but can become quite expensive. About the only method we are familiar with which might do the job is chemical milling.

This reader has been given the names of some companies which we believe, can solve his problems. —Ed.

Dodge Custom-made
Special Alloy Steel Goosenecks

. . . for longer service life
. . . less maintenance

Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available... and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy *steel*, they prevent cracking . . . bottom breakout . . . spout erosion.

Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks.

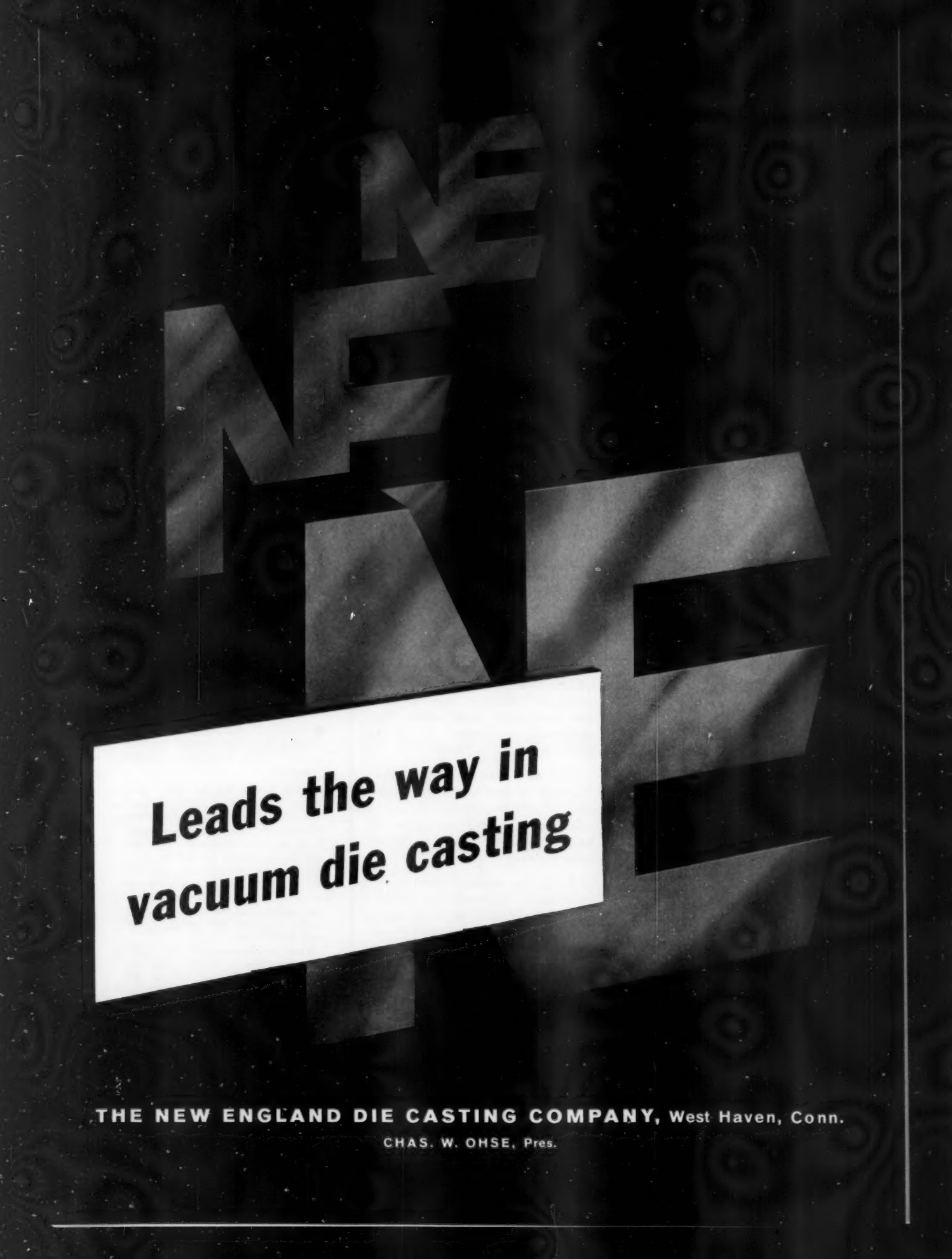
Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DODGE STEEL COMPANY

FINISHED PRODUCTS DIVISION
6501 Tacony Street
Philadelphia 35, Pa.

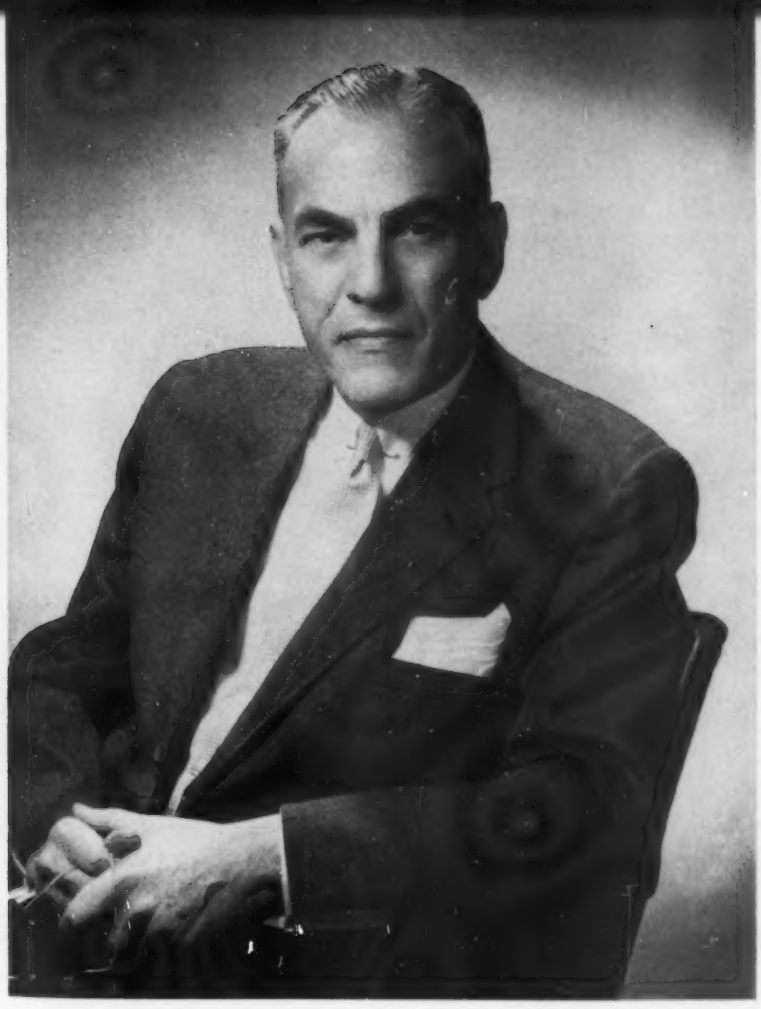
THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

Circle No. 25 on Reader Service Card



THE NEW ENGLAND DIE CASTING COMPANY, West Haven, Conn.

CHAS. W. OHSE, Pres.



IRVING B. HEXTER

1897-1960

Founder THE INDUSTRIAL PUBLISHING CORPORATION

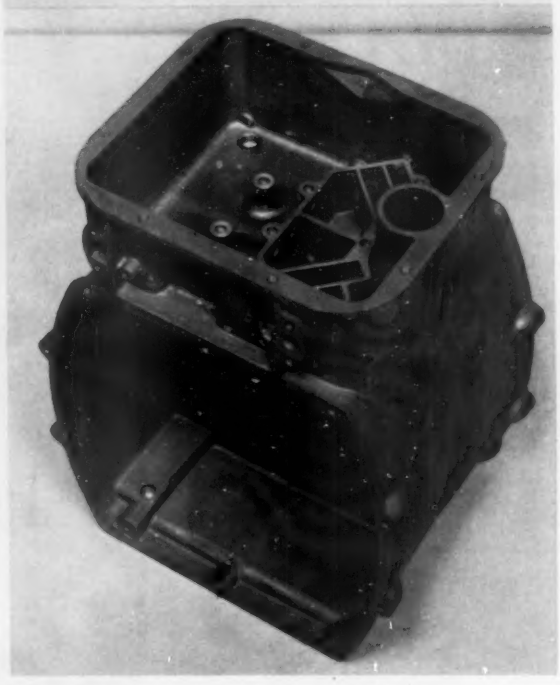
ONCE YOU MET IRVING HEXTER, you remembered him. He didn't leave neutral impressions. He probably was never neutral about anything in his life. He reacted strongly to things, responded warmly to people—and they to him. He devoted nearly as much effort to people as he did to the publishing firm he founded. Scores of worthy causes asked his help. None was ever refused. His great labor of love was the American Heart Association. He served it as a national officer for years, was the third layman ever to win its Gold Heart Award. He established and endowed a laboratory for heart disease research.

Spending time with Irving Hexter was exhilarating. He had energy enough for five men and it was infectious. He generated ideas at a furious pace; his energy sparked the men around him. You worked a bit harder than your best for him, not because he drove you, but because you couldn't do less and face him. He could spot a phony or stuffed shirt a mile away. He abhorred them.

Irving Hexter traveled 35 weeks a year, with Mrs. Hexter had seen nearly every part of the globe. Living out of a suitcase was his kind of relaxation. He could out-work, out-travel, out-enjoy-living any man in the company. With fierce energy he started a little magazine at the bottom of the depression, built it into a major publishing firm. Then, he assured its permanence by divesting himself of ownership and, more recently, day-to-day management. Not that he slowed down. Irving Hexter had only one speed: forward, high. He was researching another new publication idea when his heart failed. He died May 22 at 62, just a few months before the 30th anniversary of the company he founded.

SHELL MOLD CAST CASE—
HEAVY BUT LOW COST.

DIE CAST CASE—COSTS MORE
BUT BEST FOR HIGH PRODUCTION.



ONE METER CASE,

The Castings

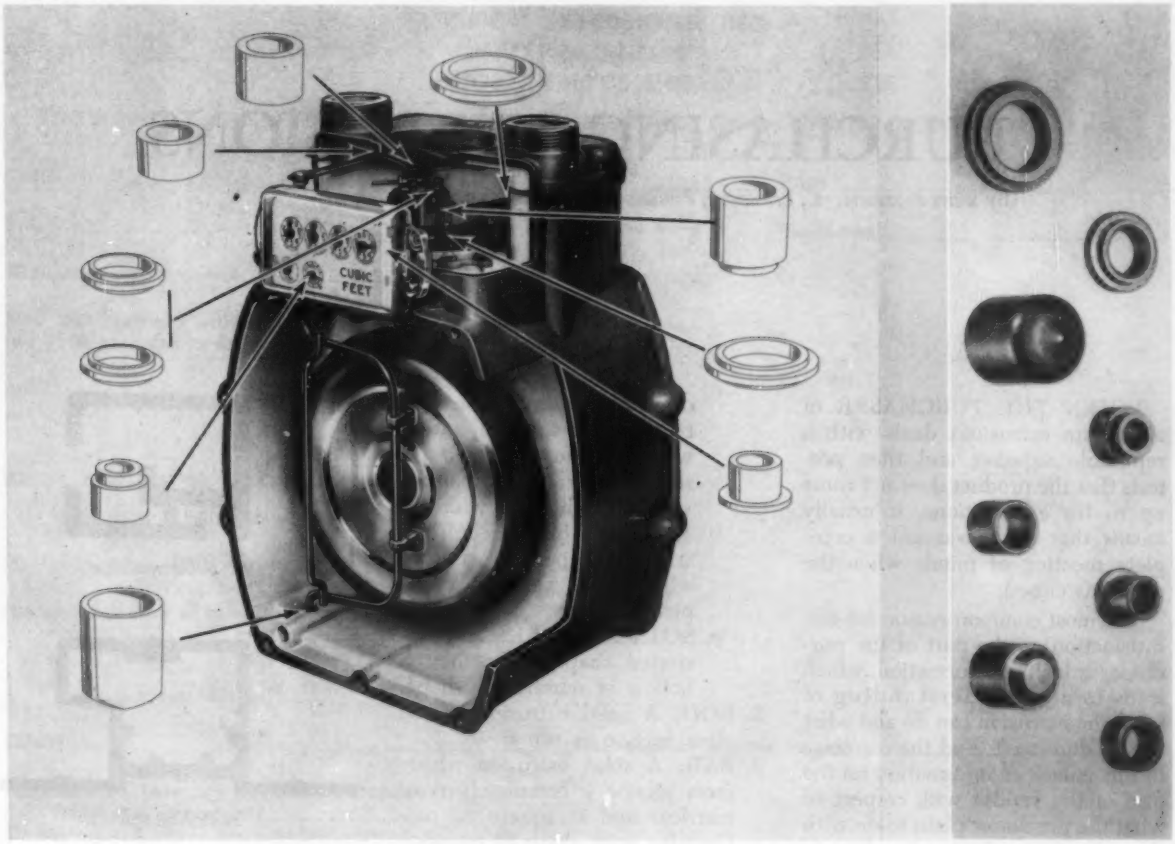
COST AND WEIGHT. This is the big difference between the two gas meter housings shown. Basically they are the same meter, and in usage are even interchangeable. The housing on the left is shell mold cast in gray iron. The housing on the right is die cast in aluminum.

The reason for two different housings for the same basic meter is that the meters are sold nationally and must meet the requirements of many different gas utility companies. Some gas companies stress light weight in the meters they purchase due to the savings incurred in shipping, handling and setting costs. The American Meter Company has found that low cost and light weight are not necessarily related. Gray iron pig and aluminum ingot may differ in cost by as much as 20 cents a pound. The cast iron case, which weighs 20 lb., costs less than the aluminum case, which weighs only 10 lb.

The cast design of a gas meter is extremely important since the meter is the "cash register" of the gas utility company; and any loss of gas measurement results in a direct loss of revenue. A gas meter is divided into compartments and measures, by volume displacement, the amount of gas introduced into each compartment. Any internal leakage in the meter, from one compartment to another, would allow a certain amount of gas to pass through the meter without being measured and would therefore be a direct loss to the utility company.

To eliminate the possibility of such a loss, American Meter Company casts their meter bodies in one piece —body, table, partition and channels. Important is the fact that two PMM processes, die casting and shell mold casting, can produce a meter housing with the same basic features, yet from different material.

With the one-piece cast design, there are no internal joints or gaskets, which eliminates the possibility of internal leakage at these points caused by casting strains, improperly machined surfaces or broken or worn gaskets. This also makes it possible to fasten the meter diaphragm to the solid middle partition to insure positive positioning and sustained alignment.
continued on page 47



THREE PMM PROCESSES

The Sinterings

WHEN BEARINGS have to operate in a sealed housing for from 5 to 15 years; when they have to retain all of the low friction characteristics they originally had for all those years; when the first cost must be very low; there's only one answer – sintered bushings, impregnated with oil.

This was the problem and the answer for American Meter Co. in their sealed gas meters.

Some of the bushings used in the gas meters are shown above. These are made by American Meter in their own powder metallurgy department. The alloy used is a bronze type containing 90% copper and 10% tin. The powders are mixed, pressed, sintered, coined, and finally impregnated. Here's the sequence of manufacturing operations.

MIXING

A drum type mixer with a free turning cylindrical screen is used. The carefully weighed powders, with a small amount of zinc stearate added as a lubricant, are put in the mixer. Mixing is done for ten minutes with the screen in the drum. The screen is then removed and mixing continued under drying lamps for 1 hour.

PRESSING

A 4 ton mechanical press is used. The weight of powder and the rate of production vary with the type and size of bushing. 4000 per hour is an average rate of production.

SINTERING

American Meter uses a pusher type, gas fired, controlled atmosphere furnace. Temperature in the hot zone is about 1500°F and production averages 1000 parts per tray. A complete cycle is 50 minutes using a 5 minute push cycle. The average furnace production is 12,000 parts per hour.

COINING

Precise sizing to meet tolerances is required. During sintering there is a slight growth of the bushing. In

continued on page 69

PURCHASING EXTRUSIONS

By KURT F. ZIEHM, JR., *President, Precision Extrusions, Inc.*

WHEN THE PURCHASER of aluminum extrusions deals with a reputable supplier and then protests that the product does not come up to his expectations, it usually means that there was not a complete meeting of minds when the deal was closed.

The most common reason for dissatisfaction on the part of the purchaser is lack of information, which leads to a misunderstanding of what the extrusion can do and what can be done to it. And the corollary to this is lack of information on the part of the vendor with respect to what the purchaser plans to do with the extrusion and what he plans to do to it.

Much of this difficulty is because the wide use of aluminum extrusions is relatively new. Aluminum has been extruded for 35 or more years, but it was not until the advent of superior alloys, some of which have been released as late as 1945, that aluminum extrusion became a major fabrication method.

Advantages of this process are many. Of probable first importance is the relatively low cost of tooling, making small experimental runs practical. It also permits a manufacturer to develop exclusive shapes, giving character and individuality to his product. In addition, complex shapes can be had at low cost, and metal can be placed where it is most needed.

Extrusions can be, and are, made in an almost endless variety of forms. To explain the terminology of the basic extrusion types, they are illustrated in Fig. 1 and defined as follows:

1. **SHAPE:** Any extrusion other than rod, bar, or tubing.
   a. SEMIHOLLOW SHAPE: An extruded shape, any part of whose cross section partially encloses a void, and in which the area of the void is substantially greater than the square of the gap width.
   b. HOLLOW SHAPE: An extruded shape, any part of whose cross section completely encloses a void.
   c. SOLID SHAPE: Any extruded shape other than a hollow or semihollow shape.
2. **ROD:** A solid extrusion whose cross section is round.
3. **BAR:** A solid extrusion whose cross section is completely symmetrical and is square or rectangular, with sharp or rounded corners or edges, or is a regular hexagon, octagon or ellipse.
4. **TUBING:** A hollow extrusion whose wall is of uniform thickness and whose cross section is completely symmetrical, and is round, square, rectangular, hexagonal, octagonal or elliptical, with sharp or rounded corners.

When purchasing extrusions, remember that the supplier requires considerable information in addition to the design of the shape. This must be complete in order to avoid misunderstandings and to place the supplier in position to meet fully the needs of the purchaser. Very often the getting of the necessary information is the big problem of the sales engineer.

In some cases, the purchaser feels that the privacy of his company's business is being invaded when detailed questions are asked concerning what is to be done to the extrusion, how it is to be assembled with other materials, and what the end use is to be. But the answers to such questions are of great importance if the supplier is to be of the greatest possible service in recommending the alloy to be used and in making suggestions for improvements in the design of the shape.

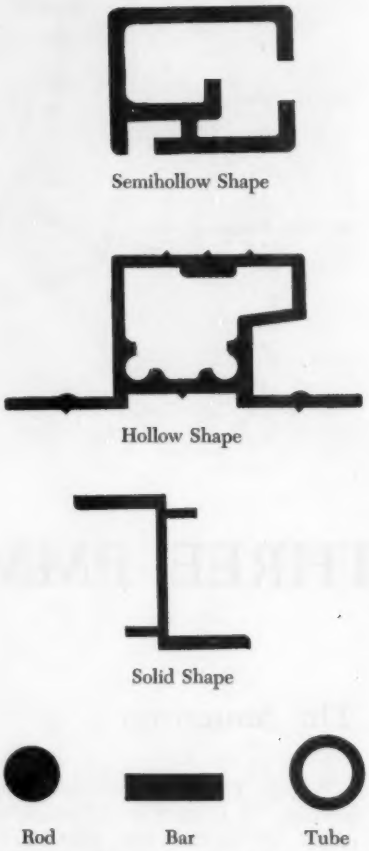


FIG. 1 Typical shapes in extruded aluminum.

There is a great variety of alloys available from which to choose, and many things enter into the determination of the one best suited to the job. The ideal one might cost too much, considering its application. Another might have the proper characteristics in all respects with the exception of the one required for the finish. For example, some

continued on page 38

PRECISION EXTRUSIONS, INC.
SALES ENGINEERS
JOB ANALYSIS SHEET

TO BE USED AS A GUIDE BY THE ENGINEERING DEPARTMENT FOR BETTER LIAISON BETWEEN CUSTOMER'S REQUIREMENTS AND THE MILL

Customer_____ Cust. Part _____ Date_____

P. E. Die_____ Salesman_____

Anticipate lbs. required_____

END USE (Explain with sketch)
(Be SURE to indicate assembly with another part or extrusion.)

ALLOY AND TEMPER

Note: Is this part formed or bent?_____

If so, how drastically?_____

(Be sure bending or forming on H.T. parts is not beyond limit.)

Are holes punched?_____

Is piece sheared?_____

LENGTHS_____ Random or shorter lengths_____

TOLERANCES (Are any closer than standard?)
Which are important?_____

FINISH REQUIRED: Exposed?_____ Buffed?_____ Anodized?_____

Remarks regarding finish:

SUBSEQUENT OPERATIONS BY P. E.

1. Cut to Length
2. Special Cutting Tolerances
3. Drilling Location Dia. Set-Up
4. Punching Location Dia. Set-Up
5. Section Correcting (Rolling Closed, etc.)

SUBSEQUENT OPERATIONS BY CUSTOMER
(Indicate everything you know about the job not covered above.)

CRATING AND SHIPPING INSTRUCTIONS_____

(Type of bundle and details.)

Size_____

Can P. E. guarantee good arrival in this package?_____

Unloading Facilities

(Can customer handle packaging required?)

Miscellaneous

FIG. 2 FURNISH YOUR EXTRUDER all of this information in addition to essential design information. You'll get a better product.

alloys show a discoloration when anodized; others provide a gray appearance when brightness is wanted. Still others do not respond well when color is required. However, being in possession of all the facts permits choosing an alloy that will meet all the requirements of the purchaser.

Are the extrusions to be formed? Machined in any way? Are they to be assembled with other parts? Are tolerances to be closer than standard? What about the required strength and resistance to corrosion? Is a heat-exchange problem involved? These are some of the questions that should be answered if the vendor is to be in a position to give counsel and to furnish extrusions to meet the requirements of the job. Sales engineers of our own company are provided with a form, fig. 2, which helps greatly in providing information for the engineering department to be used in working out final details with the customer.

Careful consideration should be given to the design of the shape. Often the design presented to the extruder is excellent from the standpoint of appearance and suitability for assembly with other parts; however, it may present a problem in extruding the shape or it may make it impossible to obtain good results in anodizing. Poor design can reduce die life, make production uncertain, and add greatly to the cost of the extrusion.

Where the extruder offers a competent design service, modifications can be made in the customer's design without serious loss of time and without loss in appearance or suitability for the intended application. fig. 3 shows a "before and after" example and illustrates some simple principles of design which eliminated trouble spots from the original designs of customers.

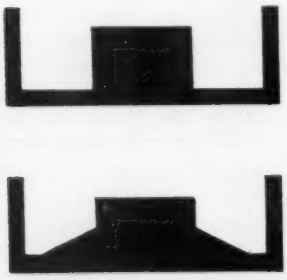


FIG. 3 DESIGN CHANGES can improve mechanical properties and the finishability. The original design (upper) gave spotty anodizing. The reversed design (lower) eliminated this by better grain structure.

Design revision, shown in fig. 4, eliminated extrusion difficulty and reduced the die service charge. Reference is made in the caption to the reduction in diameter of the circumscribing circle. The explanation of this is that the accepted method of determining the die service charge is by means of the diameter of the smallest circle that will circumscribe a cross section drawing of the shape. The smaller the circle, within certain limits, the less the die charge.

Another matter which should not be overlooked from an economy standpoint is the availability of standard shapes without die cost. This is because extruders have developed certain stock dies which eliminate die-making time and expense when such standard shapes are required. As an example of the number of such dies in the stock rooms of extruders, we have in our plant more than 5,000 for a great variety of shapes, which are designed for economical production.

Where a standard shape is suitable or can be used by making changes in the original design, worthwhile savings can always be made, and especially on short-run jobs. Where the run is of sufficient poundage with a special die or where the accumulated total within a year reaches a certain point, the die-service charge is refunded.

Since, in almost every case, the extrusion of aluminum shapes offers impressive advantages over other methods of fabrication, it is simply good business to press these advantages to the very limit, so that savings in time and money will be as great as possible. And the best way to do this is by close cooperation between the user and the supplier. A complete exchange of information permits the supplier to make sound recommendations and tells the user just what he can expect from the extrusions he is buying. It is the way to achieve understanding and a complete meeting of minds, which prevents disagreements and permits both parties to profit from the transaction.

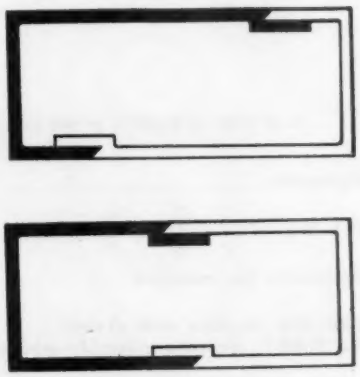


FIG. 4 ANOTHER DESIGN CHANGE to permit the use of a smaller and less expensive die. By making the two parts join in the center the circumscribed circle is smaller, metal flow is better, and costs are cut.

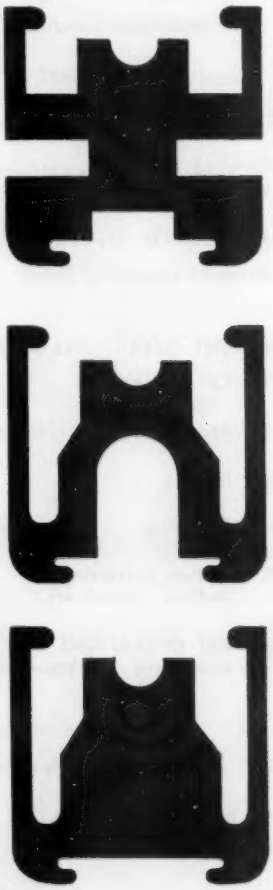


FIG. 5 HERE'S WHY the extruder needs to know the end use. The original design (top) is expensive to make and gives poor metal flow. The first revision (middle) is a bit better. The final revision (bottom) is much better and less expensive; still does the required job.

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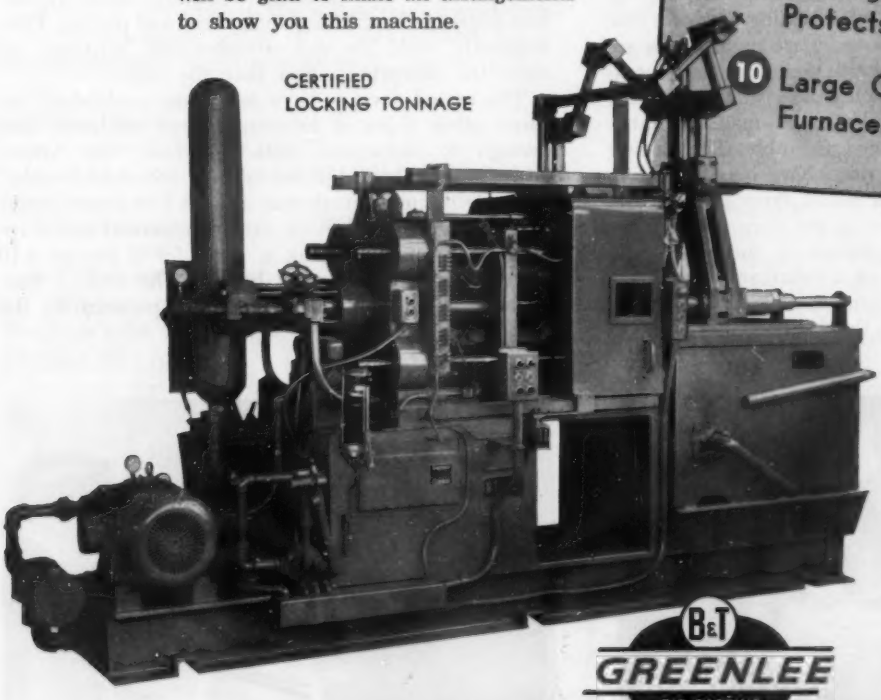

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CASTINGS CORPORATION SOLVES PERMANENT MOLD PROBLEMS

A FUNDAMENTAL PROBLEM in permanent mold casting has always been the release of the finished casting from the mold. Breakage has been—and still is—a major concern.

Oswego Castings Corporation, Oswego, New York, a division of Oberdorfer Foundries, Inc., of Syracuse, manufactures several products which fall into this category, among them aircraft pump bodies and gas meter housings. These parts, because of their complexity, require special mold coatings to enable the molder to take advantage of the skillful mold design.

Molding the gas meter housing represented a real challenge to Oswego engineers. The housing, cast in 356 aluminum alloy, is shaped somewhat like a large bucket having an integral rib dividing it down the center. The corners of the housing are rounded, as are the bottom edges. Walls of the container are but ¼-inch thick at the top. A ⅝-inch flange runs around the top. Close tolerances must be maintained so that a cover may be installed in final assembly. The casting weighs 26 pounds after the risers have been removed.

The problem was one of metal flow and release. The relatively tiny aperture in the core for forming the rib, plus the rounded corners on the core made necessary the introduction of a lubricant, or release agent, at these points to assure both easy extraction and absence of "holidays" in the finished piece.

There was also the serious problem of 'misruns' when the rib would break off from the housing during extraction. Removing the aluminum from the rib aperture took as long as three or four hours, according to Frank Fox, production foreman. "A few consecutive 'misruns' with a lubricant, when we are convinced that all other factors are perfect, is enough reason to discontinue its use," said William A. Mader, vice president, technical services.

Several mold washes were tried without success until engineers introduced 'Aquadag', a product of Acheson Colloids Co. This is a dispersion of collodial graphite in water.

It provided a more uniform casting, smoother surface finish, and facilitated metal flow and parting. Consequently, mold life was extended and "misruns" became the exception rather than the rule.

The actual savings have not been established because other types of lubricants were not used long enough to determine costs. However, Mr. Mader added, "I would judge the savings are considerable."

In use the mold wash was diluted 1 to 3 with water and sprayed on the mold with commercial spray apparatus. A single coating is good for a run of 8-10 pieces. Metal is poured at 1400°F. The mold is preheated to 700°F and kept at that temperature by the casting cycle.

THE COMPLEX PERMANENT MOLD used at Oswego Castings to cast the high-pressure gas meter housing.

A HIGH-PRESSURE gas meter housing, permanent mold cast, is examined by W. R. Mader (left) and Frank Fox (right).

HEAT TREATING HIGH HARDNESS, HOT WORK TOOL STEEL

A NEW HOT WORK TOOL STEEL which has excellent resistance to high temperature wear, strain, impact and heat checking, is made by Uddeholm Company of America. It is a chromium-tungsten-cobalt alloy called UHB Calmax. The hot hardness of Calmax is much greater than that of the commonly used hot work tool steels. In one production comparison, Calmax cores produced 15,500 brass die castings while a 9% tungsten steel made only 5,000.

The high temperature properties of Calmax make it suitable for:

- Cores in die casting dies for brass and aluminum.
- Die casting dies for brass and other high melting point alloys.
- Extrusion dies and mandrels for the hot extrusion of copper and its alloys.

HEAT TREATING PROCEDURES

Calmax is delivered in the soft annealed condition ready for machining unless otherwise specified. These are Uddeholm's recommended heat treating procedures:

ANNEALING

- Heat to 1550°F to 1650°F.
- Hold at temperature for 2 to 4 hours, depending on tool size.
- Cool slowly at 15°F to 25°F per hour, until about 1000°F.
- Below 1000°F the tool may be removed from the furnace and cooled freely in air.

Hardness after annealing is 300 to 320 Brinell.

STRESS RELIEVING

To avoid distortion from the hardening treatment, stress relieve after machining and before hardening.

- Heat to 1050°F to 1200°F.
- Hold at temperature for ½ to 2 hours, depending on tool size.
- Cool to 900°F gradually in the furnace.
- Below 900°F the tool can cool freely in the open.

HARDENING

- Preheat slowly and uniformly to 1200°F to 1300°F and hold long enough to allow uniform heat penetration.
- Heat more rapidly to 2000°F and soak.
- Soak for 10 to 20 minutes to insure proper carbide solution. This produces a hardness of of over 54 Rockwell C. See figure 1.

For best results final heating to 2000°F should be done in a neutral salt bath or controlled atmosphere furnace. This protects against carburization or decarburization, which greatly reduces tool life. Cool the steel in air or quench in oil. Air cooling is better because it causes less stress and distortion.

TEMPERING

Temper when the tool cools to room temperature.

- Heat to 1000°F to 1250°F.
- Soak for 3 hours after the tool has reached a uniform temperature.
- It is better to double temper with intermediate cooling to room temperature.

Calmax dies are usually tempered to 48 to 52 Rockwell C. See figure 2. Cores should be tempered to 48 to 50 Rockwell C. Because of its high resistance to heat check, you can use Calmax at a higher hardness than other steels ordinarily used for the same purposes.

Don't remove the film or layer of oxide that appears after heat treatment. It protects the tool and keeps the working material from sticking to it.

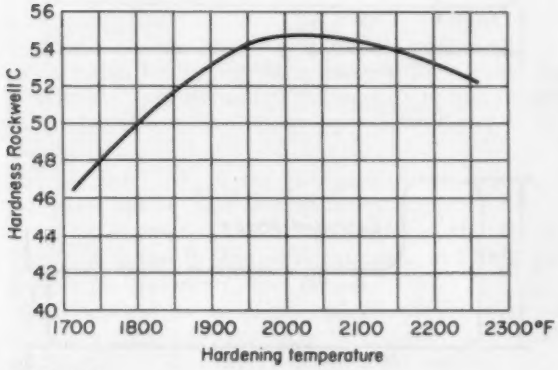


FIGURE 1

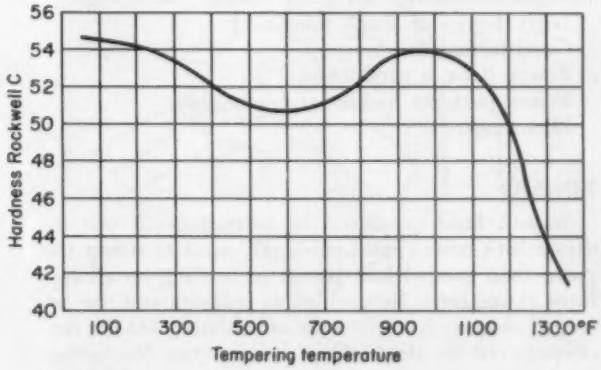


FIGURE 2

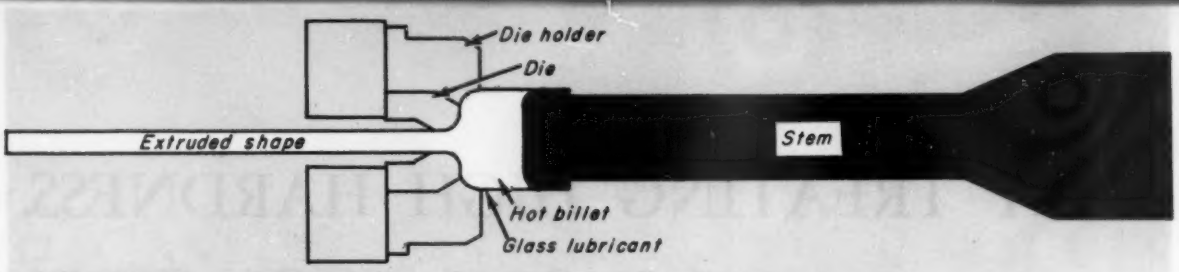


Fig. 1 From billet to extruded shape

STEEL AND SPECIALTY ALLOY EXTRUSIONS

Part III – Practical Applications

DESIGNERS AND PURCHASING AGENTS recognize the greater savings possible with extruded shapes made of steel. Stamping, machining, forging, and surface finishing are manufacturing methods which may be eliminated by designers who specify an extrusion. Purchasing agents get fast delivery on small and large quantity orders.

Previous issues listed design guides and specifications of steel and its alloys used in extruded parts. In this part, several actual applications are listed.

But first . . .

WHAT IS AN EXTRUDED SHAPE?

One steel extruder refers to it as: "a continuous bar, with the same contour the whole length of the bar."

A good way to illustrate how a shape cuts costs, is to show how it is formed (see figure 1). Extrusion suppliers make and trim the metal billets, and in this way control the grain structure of the finished shape. Simply stated, all that is required is the die, the metal, and a press. Changeover from one order to the next takes little time–labor costs are low and customers get fast delivery of both small and large quantity orders. Size of presses range from 1,000- to 2,000-pounds pressure. Suppliers often use a glass wool lubrication and insulation to get better performance (Ugine Sejournet method).

In the following actual cases, redesigning from stampings, forgings, machining and rolling mill runs brought costs down for good reasons, including:

High degree of shape tolerance.
Good surface finish.
Fewer steps of production.
Fewer parts to handle and assemble.
Less scrap.

FINISH

Smooth finish produced by extruding cut one industrialist's costs considerably. He used to stamp the parts, then ganged four pieces for milling on all surfaces at one time. He decided to redesign and use extruded shapes. Now he uses an abrasive cut-off machine to cut the shape into 2-foot lengths. No further finishing is necessary.

WELDMENTS

One manufacturer eliminated welding two flat bars to form an unequal leg carbon steel angle part.

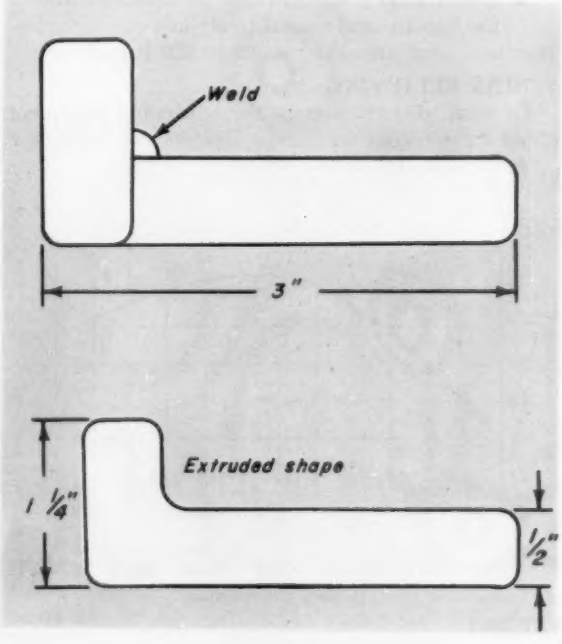
He was at a disadvantage in that the quantity required was not sufficient to meet rolling mill minimum requirements. He then took two bars, as shown in figure 2, and welded them together. The part was satisfactory but did not look professional and it cost double what it would if rolled.

Cost of making the parts were cut in half when it was redesigned for the extrusion process. Waiting for delivery while parts were welded was eliminated, and the shapes kept in stock eliminated overhead tied up in parts made in advance.

TORCH CUTTING

A substantial cost saving was found, for one manufacturer, by extruding the shape. Originally he had to have the part torch cut.

Fig. 2



At first he bought standard hot-rolled carbon steel angle iron. From this he had ⅛" torch-cut from one leg to give him the desired shape, see figure 3. Even though a good job was done, edges were rough and required extra machining to get a smooth surface. Standard angle iron was inexpensive but the two additional steps raised costs considerably.

HOT ROLLING

Hot rolling requires large production runs, in quantities which are often too expensive for the manufacturer. This is one of the greatest assets of the extrusion process. Whether the run is from 300 pounds (at times less) to sometimes over 20 tons, savings are appreciable.

Experimenting with a new part means small quantity runs. Costs of rolling mills are very high and machining of more than a few parts raises overhead costs—a good time to use extrusions.

Often the part has odd contours such as shown in figure 4. The part could never be rolled. Both designers and purchasing agents realize what it costs to set up a machine to make the part in small production runs. It is far better to extrude the shape.

MACHINING

Scrap machined from a bar is expensive. Again figure 4 illustrates the savings one manufacturer realized by extruding the stainless steel shape. Because of the odd configuration it could not be rolled. To machine it from bar stock stainless meant expensive milling costs and a great deal of expensive metal would remain as scrap.

It was realized right at the start that although initial cost of the finished shape is greater than bar stock stainless, by eliminating scrap metal, costs are cut considerably.

ALLOY FORGING

Extrusion dies cost less than forging dies. Certain parts, because of their shape, can be made easier by the extrusion process than by forging. This is especially true in the range of workability found among alloy steels.

Again production runs are important. When the quantity is too small to consider forging dies, (such parts as cross-bar and crow-foot handles for specials or short-run jobs) the parts are made cheaper by extruding.

For example, look at figure 5. Where intricately contoured parts such as rocker arms, quadrants, and hydraulic cylinder parts are required, greater savings are possible by the extrusion process. This would be true even if quantities are great enough to make them in the foundry.

Editor's note: This is the final part of this article on the extrusion of steel and specialty alloys.

All of he material was furnished by Mr. H. M. Tuttle, Assistant to vice president, sales, of The H. M. Harper Co., Morton Grove, Illinois.

Information on specific applications for steel or specialty alloy extrusions can be secured from either PRECISION METAL MOLDING *or from the Harper Co.*

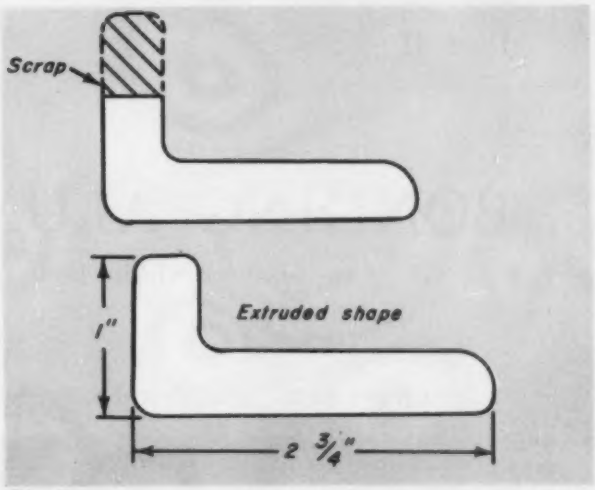


Fig. 3

Fig. 4.

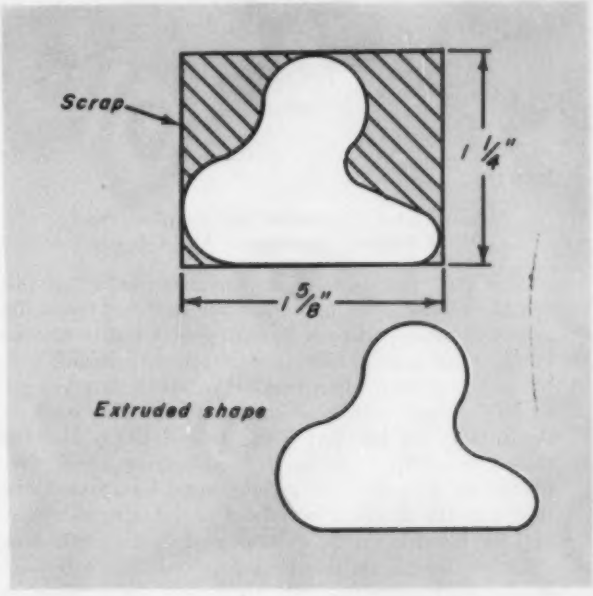
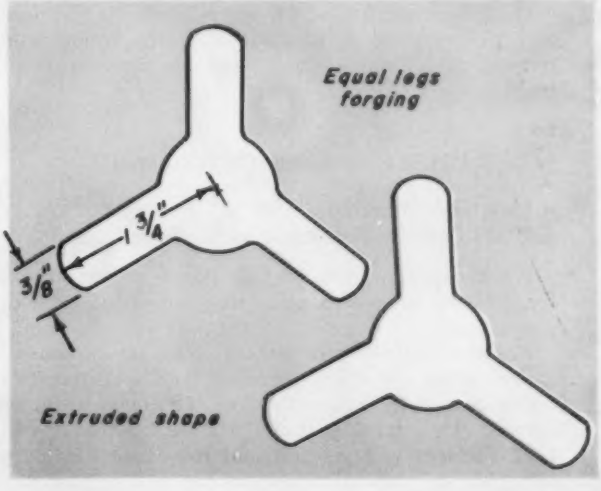


Fig. 5



Part II

BONDING ALUMINUM TO STEEL

Case histories which show applications of the Al-Fin process

AIRCRAFT FUEL LINE FLANGE

FIG. 1

Materials: Aluminum and stainless steel.
PMM Process: Permanent Mold, figure 1.

This part is made for a manufacturer of aircraft flexible tubing. The manufacturer supplies the stainless steel tubing, already bent to shape, but somewhat longer than needed. Tickle vapor-degreases and grit-blasts the tubing, then masks the areas that are not to be bonded with colloidal graphite. The ends of the tubing are blocked with tapered plugs and the tubing is dipped in molten aluminum, and then placed in the mold. After the casting has cooled, the tubing in the flange is bored out to the desired height. and the internal thread is machined in the aluminum.

Excess length on the tubing permits it to bottom in the mold, simplifying its placement and preventing the aluminum from flowing up the tube.

Originally the part was designed as a dry sand casting, but because of the large quantities required and to better maintain position of the tubing and reduce machining, it was redesigned for permanent mold casting.

DIESEL ENGINE PISTON SKIRT

Materials: Aluminum and cast iron.
PMM Process: Permanent Mold, figures 2 and 3.

It's cheaper to rebuild this diesel engine piston for a stationary power plant than to replace it with a new one.

A comparatively soft surface, such as aluminum, is desirable since it will surround hard scuff particles rather than permit them to score the engine cylinder barrels. Also, hard particles abraded between two hard surfaces will get hot and may ignite cylinder gases, causing an explosion.

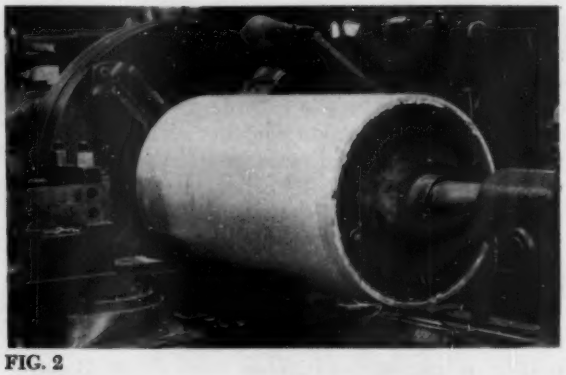


FIG. 2

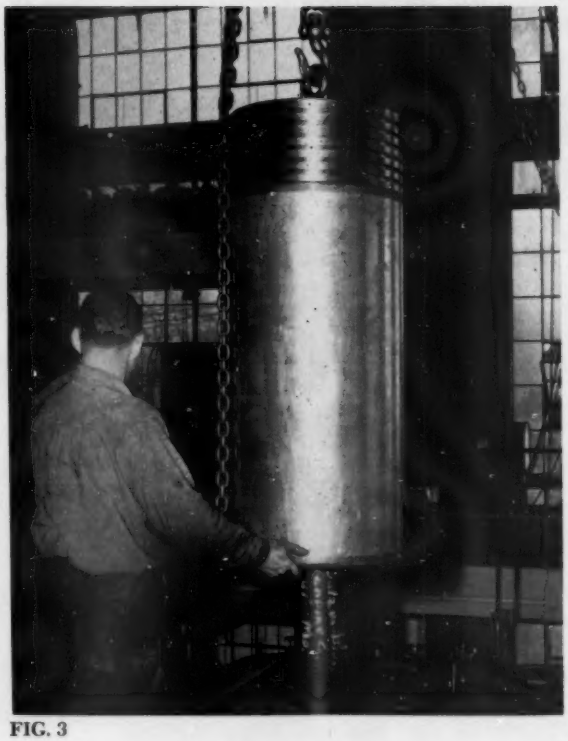


FIG. 3

Tickle machines the piston down to 0.5 in. undersize on the O.D., then cleans and hot dips it. The aluminum muff is cast oversize and then machined down to original size.

TIMING GEAR BLANK

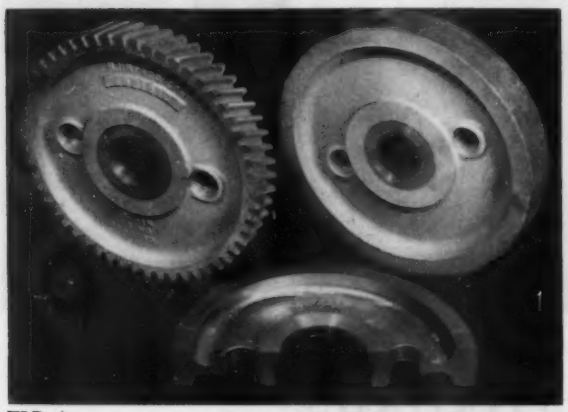


FIG. 4

FIG. 5

Materials: Steel and aluminum.
PMM Process: Permanent Mold, figures 4 and 5.

After the steel insert is cleaned and hot-dipped, the aluminum body is cast around it, and the gear teeth cut in the aluminum.

This timing gear is used in a General Motors truck engine. The aluminum teeth help it run quietly. An all-aluminum gear was unsuccessful due to the key-way slot failing, but with Al-Fin construction this problem was eliminated.

RADAR SPARK TUBE

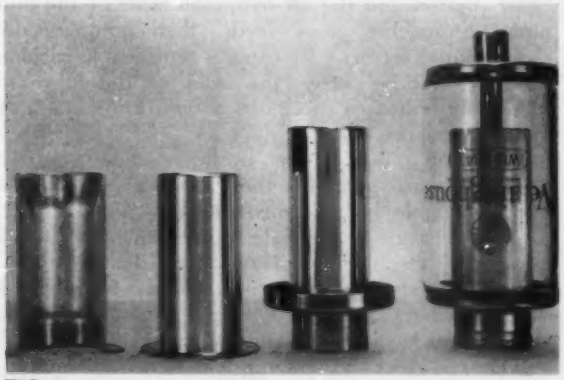


FIG. 6

Materials: Aluminum and steel.
PMM Process: Permanent Mold, figure 6.

The cast aluminum sleeve is bonded to the steel eyelet (see detail in sectioned piece at left of photo). The eyelet is then seam-welded to the Kovar cup (second from right), to which the glass is then sealed.

Although the length of the bonded area joining the aluminum and steel is only ⅛ in., this is enough to prevent separation of the two metals when machining the O.D. and boring the I.D. of the aluminum.

AIRCRAFT RADIAL ENGINE CYLINDER BARREL

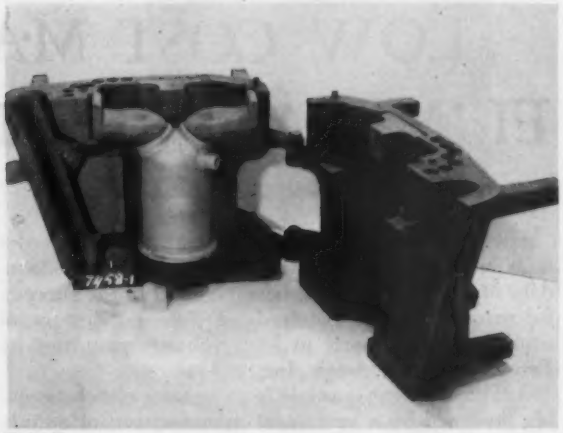


FIG. 7

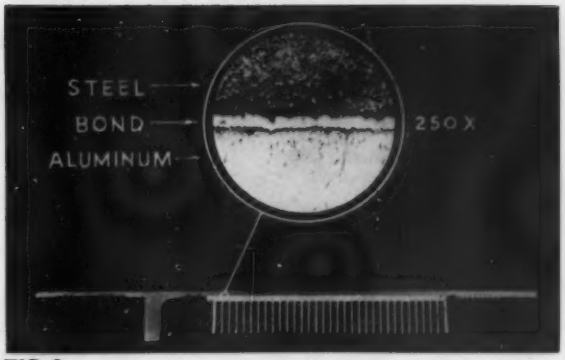


FIG. 8

Materials: Aluminum and steel.
PMM Process: Permanent Mold, figures 7 and 8.

An aluminum muff is cast around the steel barrel; then the cooling fins are machined in the muff.

The open breakaway mold (fig. 7) shows some casting details. The aluminum is poured down to the bottom of the mold and flows up around the steel barrel, giving thorough flushing. The two sand cores at the top of the barrel seal off the cavity by preventing the aluminum from flowing into the ports.

Cross-section photo (fig. 8) shows the depth of the cast aluminum muff in the area where the fins are machined. Photomicrograph shows the bond, 250X.

FIGURE 1

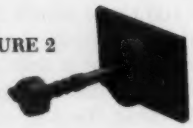


FIGURE 2

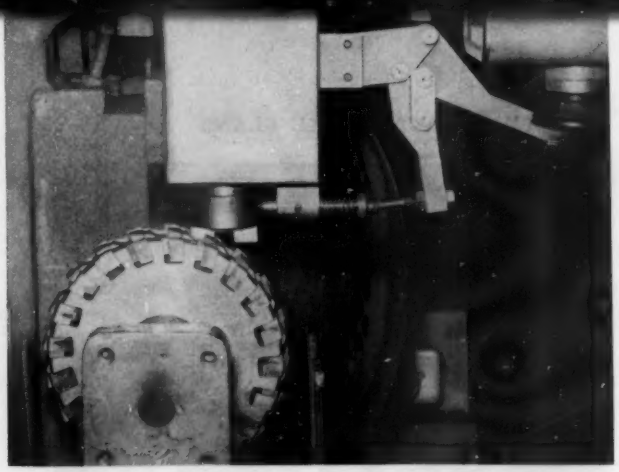


FIGURE 3

LOW COST MACHINING ELIMINATES COINING

The modern production techniques of powder metallurgy combined with efficient, precision secondary finishing operations, have resulted in the successful manufacture of hundreds of different designs of complex shaped parts in high volume quantities by Ferro Powdered Metals, Inc.

A typical recent example is an agitator clutch assembly designed by a prominent manufacturer of quality washing machines. Ferro makes three parts for this unit; a clutch cone, a shifting collar, and a clutch jaw with driving lugs and splined hole (figure 1).

Because of the severe service life requirements of home laundry systems, a copper infiltrated steel material was selected for the clutch jaw. The critical physical properties are:

Ultimate tensile strength	60,000 psi
Yield point in compression (.1% offset method)	65,000 psi
Elongation	1%
Density	7.1/7.6 GMS/CC
Hardness	60/70 R_B

After pressing and sintering, the infiltrating process (a second furnace operation) adds approximately 20% copper (by weight) to the sintered steel body. A copper slug which has been placed in contact with the sintered iron body melts at the infiltrating temperature (2050°F) and the molten copper is carried through the pores of the iron body by capillary action completely closing the pores. In addition to the strength and ductility obtained, the infiltrated part has excellent machinability.

The design of the clutch jaw requires that the driving lugs be central with the splines in the bore within +0.001". Due to the shape, the size of the part, and the material to be used it was not practical to attempt to hold this dimension by powdered metal techniques alone. Ferro decided to employ an inexpensive punch press broaching operation (see figure 2) to provide a straight, accurate, splined hole and then take a light finishing straddle-mill cut on the flanks of the driving lugs (figure 3).

This choice of operations made it possible to omit sizing or coining tools entirely and to use relatively inexpensive compacting tools. Because all critical dimensions are later machined, the forming tools have an unusually long life. In the case of the splined compacting core for example, the original core produced 400,000 compacts and is still in use. Normal life for a core would have been about 100,000 pieces.

Since the driving lugs could be pressed to shape with only a small amount of stock to be removed (approximately .010 per side) Ferro decided to take advantage of one of the fast, accurate U.S.–Burke No. 1 Milling machines in its plant for the critical milling operation.

This small mill, product of the U.S.–Burke Machine Tool Division, because of its extreme flexibility, provided a simple set up for this operation and proved to be the key number in a reliable process which enabled the washing machine manufacturer to take advantage of powder metallurgy economies.

In the milling operation the operator simply locates the part on the spline in the fixture. A quick acting clamp is used to lock the part securely. He pushes the "start" button and the air hydraulic table of the mill rapid approaches, slow feeds, then automatically returns rapid traverse. By using a replaceable carbide inserted straddle cutter, the sides of the lugs are accurately milled to specification with a minimum of tool maintenance.

According to J. F. Helsel, president of Ferro, these small mills are ideal for their type of work, since they are simple and add flexibility at a nominal cost. No. 1 U.S. Mills at the Salem plant have facilitated set-up for the variety of functions demanded by Ferro's diverse production of molded and sintered metal powder parts. Low cost mill capacity is available also for keyways, drilling, sawing, slotting, squaring, cut-off, short-run splining and light slab milling, all of these operations are sometimes demanded.

THE SHELL MOLD CASE

American Meter replaced a sand casting with a shell mold casting for the following reasons:

- Accuracy—Closer tolerances could be maintained.
- Uniformity—All castings would have the same specifications. Sand castings often vary.
- Better Coring—The meter bodies produced from dry sand cores used in sand casting were not adaptable to automated machining. When the company machined the cases with standard tools and fixtures, it wasn't difficult to overcome poor coring. But when the machining was automated, the dry sand coring could not be tolerated. The shell mold process supplies the precision coring that is needed for an automated operation.
- Less Waste Material—Less amount of stock to be machined away.
- Better Appearance—A more uniform and smoother surface could be obtained with the shell mold process, which resulted in a more attractive finished product.

Furthermore, no design change was necessary in the move from sand to shell mold casting. The only machining required to complete the shell mold casting was to mill the surfaces and drill and tap the holes.

THE ALUMINUM CASE

Die casting is the only practical way to make the aluminum case on a volume production basis. The cases are cast by Light Metals Div., Thompson-Ramo-Woolridge, Inc., and Accurate Die Casting Company. All major holes are cored in the part. The only machining necessary is to mill the surfaces and tap the holes. In the picture of the as-cast meter body, it can be seen that nearly all the holes have been cored in the part.

The difficulty with aluminum die casting is in coring two holes. The slots angle down and open into the large diameter outlet channel of the meter. It is not possible to cast this opening with one core. A vertical straight pull core was tried first for the top part, and a core with the radius portion was pulled from the side. The disadvantage of this method was that the coring hole was left in the outside of the body and had to be plugged.

This coring problem was solved by designing a loose core in two parts. Although the use of the loose pieces slowed the casting operation, the costs saved by eliminating the hole-plugging operation more than offset the somewhat slowed production.

Both the aluminum and iron case meters are rated at 5 psi working pressure.

DFC Furnaces

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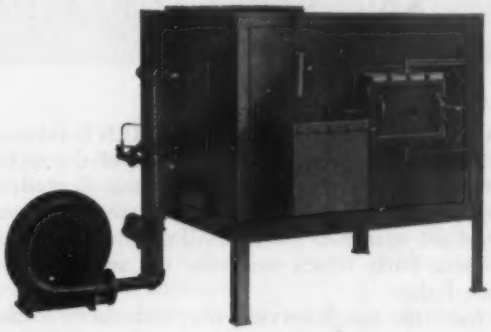
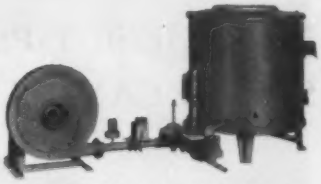
1300-lb. capacity— in just 36 sq. ft. of floor space!



REVERB-O-MELTER, reverboratory aluminum melting furnace, available in either stationary or tilting types, gas-fired. Separate charging and ladling buckets allow simultaneous operations, built-in access door for fluxing and puddling. Used for die casting, permanent mold casting, conveyorized production of small sand castings.

Tangential firing— no crucible hot spots!



Rugged crucible and pot type, stationary melting furnace, for melting at temperatures up to 2200° F. in graphite crucibles. Gas or oil fired; adaptable to manual or automotive temperature control as well as flame safety equipment. For melting non-ferrous metals: copper, brass, bronze, gold, silver, etc.

DFC produces a complete line of industrial furnaces designed for simplicity, durability and efficiency.

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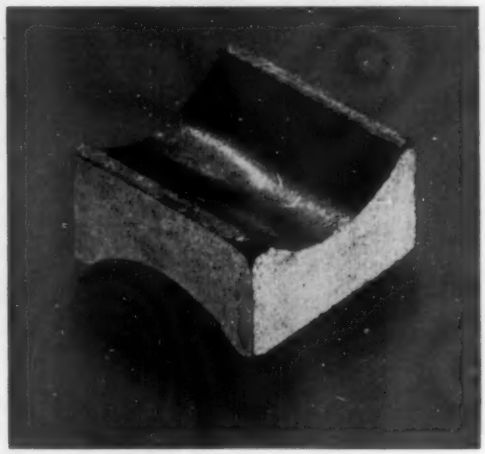
DESIGN FOR THE PMM PROCESSES

SINTERED BEARING AND STRUCTURAL PART



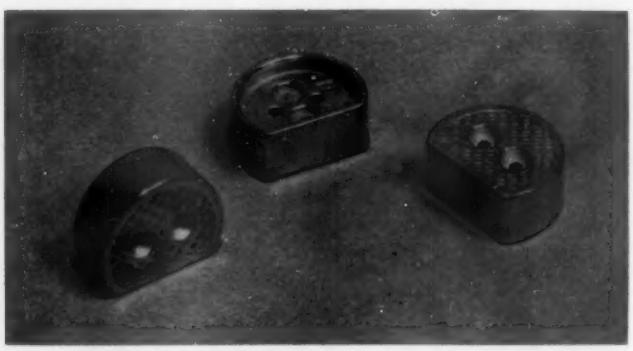
MATERIAL HANDLING EQUIPMENT takes a beating. Operating conditions are some of the worst found anywhere. Often the equipment is located in difficult to reach places; as a result even minimal maintenance is seldom given it. All of this adds up to component parts which can take the severe abuse without failure.

To meet the tough service, one manufacturer has turned to sinterings for some components. The part illustrated serves as both a bearing and as a structural part. It has to meet close dimensional tolerances, but because other parts can not be made as consistently accurate as a sintering this part must also be made in various thicknesses to compensate for "stack-up" of tolerances in assembly.

This compensating thickness is easily done by just changing the depth of fill during compacting; no other change is needed. That's one of the big advantages of powder metallurgy. Any other manufacturing method would need new tooling or a major change in set-up.

The material used is a bronze alloy designated as MC-6A by Eaton Mfg. Co. which makes the part. After sintering and coining, the bearing blocks are oil impregnated so that no further lubrication is needed for the life of the equipment. Little wonder why it is well accepted for material handling equipment.

NEW HEEL TIPS BY SINGLE-CAVITY MOLDING



Milady can now have higher spiked heels, keep the tips wearing longer, and receive direct benefits from the manufacturer's lower production costs. These new lifts, introduced by Gries Reproducer Corporation, are the products of a new and unique single-cavity molding technique Gries recently began. The lifts sell for $8.50 per thousand in 10,000 unit lots.

Small and neat, the cleats are designed to follow fashion trends—to keep up with the times, the trend too narrower heels. Here the new process pays off.

This die casting method makes a wonderful finish. Solid zinc alloy finished in bright nickel, brass gilt plate (gold), or black adds "smartness" and length to the heel. The surface is smooth and doesn't require extra machining. There are no rough edges or burrs. It takes only one operation to make the product, include either two or three nail holes with countersunk holes to protect nail head, and provide the recessed surface that wedges onto plastic or wooden heels.

What else for the die cast zinc lift? A checkerboard pattern on the bottom adds traction for the wearer, as well as enhance the appearance of the shoe.

The photograph makes the lifts seem large, but check these measurements: the two-nail lift measures 15/32 x ⅝ inches, the three-nail type is 33/64 x 7/16 inches. They are tiny, but are mounted flush to the heel stem even when the heel is irregular or unevenly wrapped in suede or other material.

SWITCH COSTS CUT— PARTS ARE DIE CAST

Labor costs at Clarostat Mfg. Co. Inc. were considered high for production and assembly operations on small switches. For example, on the on-off switch shown, three parts had high costs because they were stamped or machined—rocker arm, stud, and post.

Preliminary studies made by Gries Reproducer Corp. engineers showed that automatic, single-cavity die casting might effect a savings. It did. Precision die casting the stud cut costs 40 percent. By combining the post and rocker arm into one casting, savings amounted to 53%. In effect the higher initial costs of the dies were well repayed with long runs of the units. But the benefits didn't end here.

There were labor savings in dimensional uniformity of parts. No more "trying" to make a part fit when it was the wrong size. With equal dimensions of all similar parts, automatic assembly was possible.

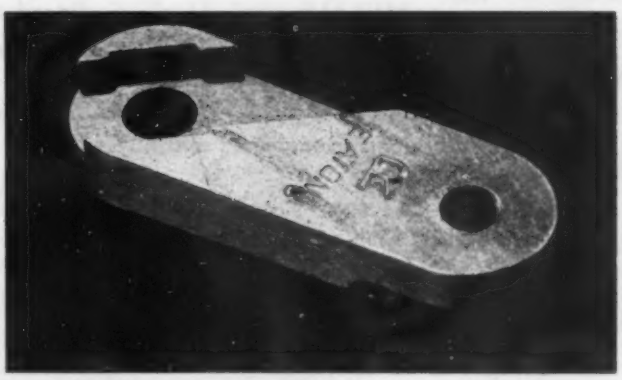
Die casting benefited end-users with improved switch performance.

By cutting down on the number of parts, inventories were reduced, inspection time cut.

Another benefit is more rigid or "beefed-up" parts because extra metal can be put where stress is high, less metal where stress is down.

COPPER-IRON SINTERING

- KNOCKS CORROSION
- WITHSTANDS IMPACT

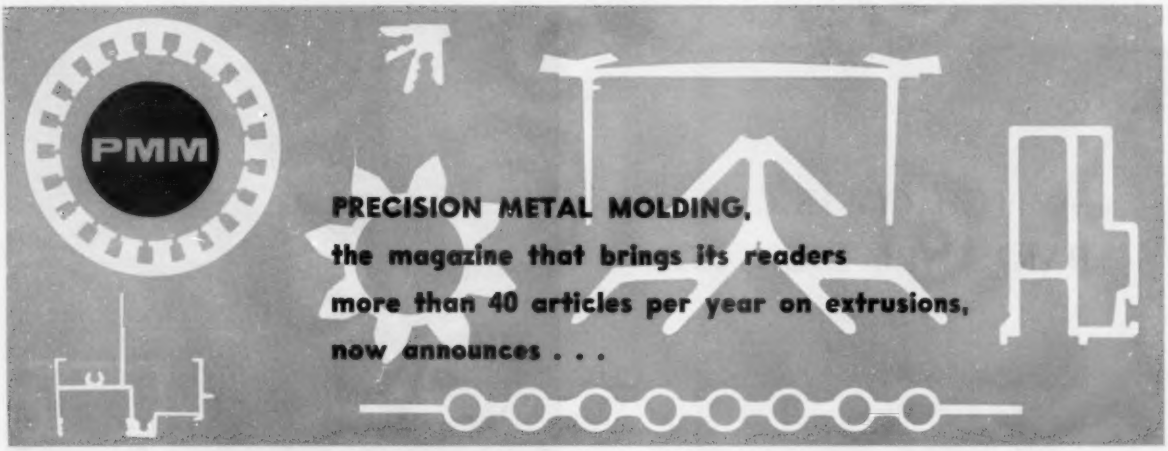


SERVICE CONDITIONS of a lawn mower are severe. Many of the parts have to stand high loads, sever impact, and highly corrosive conditions. All these can be met, but at a high manufacturing cost.

An example of such a part is the wheel arm for a rotary lawn mower. This part (see illustration) raises and lowers the wheels to vary the cutting height. It must take the full load when the mower is pushed through heavy grass or weeds.

Holes and humps in the lawn impose a shock load when the unit hits them. While various fertilizers and weed killers are good for the lawn, they may be extremely corrosive to metals, particularly to steel. Some protection must be given steel parts and generally the part is chromium plated.

One manufacturer solved all of the problems and got a cost reduction at the same time by changing to a copper infiltrated iron sintering. The part, as made by Eaton Mfg. Co. is pressed from iron powder, sintered and then infiltrated with copper. It can be carburized and hardened to give the strength and hardness needed. At the same time the copper content does an effective job of resisting corrosion. If desirable such a part may be electro-plated by any standard method, but this is only necessary as a decorative measure.


PMM
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more than 40 articles per year on extrusions,
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The First Annual EXTRUSION DIRECTORY

IT WILL INCLUDE everyone in the extrusion industry. Listings will be based on accurate, up-to-date information obtained from companies listed. Here's what will be included:

- **EXTRUDERS** —arranged alphabetically and geographically, with information about metals extruded by each.
- **PROPRIETARY EXTRUDED ITEMS** —made by extruders will be listed.
- **EXTRUSION EQUIPMENT** —arranged according to major headings, will include manufacturers of machinery, furnaces and heaters, dies and die steels and all other equipment used in extrusion.
- **METALS AND ALLOYS** —producers will be listed.
- **EXTRUSION MATERIALS** —listings will include expendable supplies such as lubricants, hydraulic fluids, etc.
- **TECHNICAL SECTION** —including specifications, properties and design information for engineers and buyers.

LISTINGS ARE FREE. Everyone concerned with extrusions will be listed. Only requirement is the completion of a questionnaire so that all information listed will be accurate.

THE OCTOBER 1960 ISSUE OF PRECISION METAL MOLDING will include the Extrusion Directory as the central editorial feature. (Closing date for reserving advertising space is Sept. 1.)

BONUS DISTRIBUTION of the PMM Extrusion Directory will be made at the Metal Show in Philadelphia, in addition to PMM's 24,000 regular readers.

BUYERS GUIDE for everyone concerned with designing, specifying, buying, producing or finishing extrusions will be kept on hand for an entire year.

YOUR ADVERTISING will get extra mileage and year-round effectiveness in PMM's annual Extrusion Directory. It's the best buy for your advertising dollars. Let us give you all the facts.

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AUTOMATIC BUFFING

TRIMMING

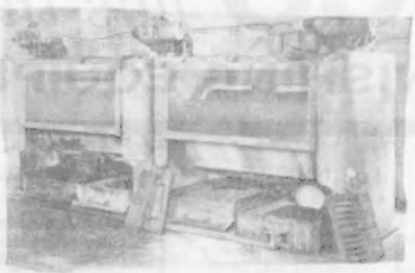
AUTOMATIC PAINTING

PMM

The specialized finishing metals, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here.

FINISHING SECTION

MECHANICAL BURR REMOVAL PAGE 53



BARREL FINISHING

SPRAY PAINTING

PLATING

HAND BUFFING

This includes all secondary operations which convert a raw casting to a finished casting.

MACHINING

ANOTHER REPORT FROM THE ALMCO ALBUM OF NEW PRODUCTS

To know what's new in Barrel Finishing

Keep Your Eye on ALMCO!

The right machine, the right method, the right media . . . that's the basis for planning any ALMCO *Supersheen* System. And a continuing program of research, ever seeking even better barrel finishing . . . that's the secret of ALMCO progress in making metal finishing easier, faster and finer . . . and more profitably productive for you. Shown below are typical recent developments that give concrete meaning to the phrase, "*To know what's new in barrel finishing, keep your eye on ALMCO!*"

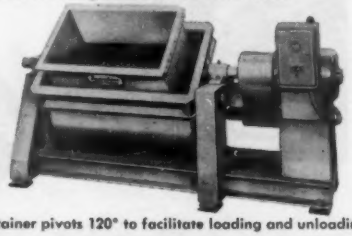
New Spindle Machine

For precision finishing of complex high-quality components such as gears, bearing cages, spline shafts, pump rotors, jet blades, etc., on a continuous production line basis. Large parts or clusters of smaller parts are chucked directly to spindles from single operator's work station. Spindles lower parts into high velocity stream of abrasive media contained in tub that rotates at controlled speed. Spindles themselves also rotate while in the abrasive stream, uniformly exposing parts to the abrasive stream. Indexing head slowly carries all spindles in 1 to 9 min. trip around the tub. All surfaces get the same amount of precision finishing.

Models available with automatic or manual indexing, 2 to 16 spindles, tub diameters of 48" to 90", and drives of 5 to 30 hp.

New ALMCO VIBRASHEEN

The new *Vibrasheen* method is particularly suited for faster burr removal from parts and finishing hard-to-reach internal crevices. This amazing metal finishing machine vibrates a full 5 cu. ft. load of parts and media . . . uses scrubbing action to remove burrs and finish parts in a fraction of the time needed in ordinary operations. Smaller and larger models also available.



Container pivots 120° to facilitate loading and unloading.

ALMCO *has the right New* BARREL FINISHING EQUIPMENT *for you!*

New ALMCO Roll Barrels

One man operates entire Roll Barrel System. Makes low-cost precision barrel finishing available to any deburring and finishing department! Ideal for finishing large variety of small lots of parts.

New Barrel Finishing Compounds

No. 407. An alkaline powdered composition used in cleaning, brightening and grinding ferrous parts.

No. 408. A very fine silica flour base powdered abrasive grinding compound for use with all metals and alloys. Provides ultra-low micro-inch finishes.

No. 410. An alkaline compound for one operation light deburring and color cycles on ferrous metals.

No. 412. A highly concentrated burnishing compound with tallow and oil soap base for use on both ferrous and non-ferrous metals.

No. 501R. A concentrated mild alkaline compound to inhibit rusting of all ferrous metals. Retains high burnishing finish.

43 other *Supersheen* compounds, plus a complete line of media, are also available from ALMCO. Ask how you can enjoy quantity discounts with the ALMCO Blanket Order Program! Start saving today!

ALMCO

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Designers and Builders of All Types of Barrel Finishing Systems for the Metal Working Industry

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MECHANICAL BURR REMOVAL

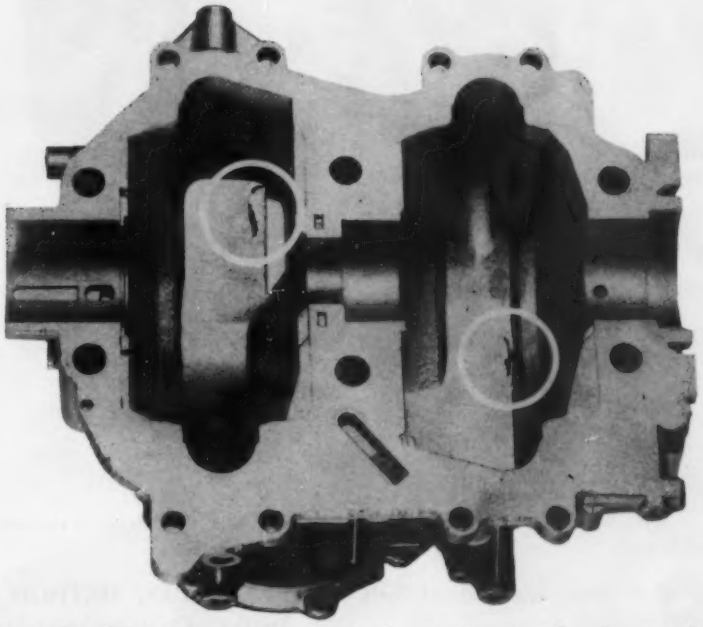


FIG. 1—This die cast aluminum crank case housing for an outboard motor shows defects in the die castings as revealed by shot blasting. The circled areas are laminations in die castings that are raised as a result of blasting. These defects would not be visible to the naked eye if the parts were not mechanically deflashed.

The precise mechanical devices made today will not permit the same caliber work which could be allowed only a few years ago.

As little as 15 or 20 years ago it was possible to let burrs remain on cast and machined parts, and have them wear off during operation. In the machines built today such burrs will completely ruin the mechanism.

It became essential, therefore, to devise machines which would remove minute burrs left on castings and machined parts and do the job rapidly enough to keep up with other mass production methods.

The solution came with the development of airless blasting, vibratory finishing, barrel finishing, and wet blasting. What are these methods?

Airless Blast Method

The airless blast process removes burrs by bombarding them with literally billions of minute-sized media particles. These particles are hurled in a controlled pattern upon the piece to be deburred by one or more centrifugal wheels.

In this method, impact is relied upon for removing the burr.

Airless blast deburring offers great advantages in speed and thoroughness. A two or three-minute blast cycle will deburr a part including recessed, difficult to reach areas and avoid the possibility of surfaces being missed through human error.

Vibratory Deburring

The vibratory process, although relatively new to the field of mechanical deburring, is a radical improvement over standard barrel finishing methods. Introduced by Lord Chemical Corporation, an affiliate of Wheelabrator Corp., vibrator machines are now extensively used for this purpose.

In addition to a rotary tumbling action being provided in this method, the entire bowl—containing the parts, media, compounds and water—is vibrated, providing a 3-way movement of the part in the media. Intricately shaped objects are deburred rapidly and uniformly without damaging the piece.

Barrel Deburring

Barrel equipment is extensively used for deburring. The gentle abrasive of specially selected media and formulated compounds gradually wears away burrs. By varying the mixture of media and compounds, the speed of the action can be accelerated to any degree consistent with the finish that is required.

Wet Blast Deburring

The wet blast process of deburring, utilizing a controlled slurry of selected abrasives and water, is ideal for removal of very fine burrs from tool edges. Although not normally a production application for deburring, wet blast equipment is ideal for those parts where tolerances to .0001" must be maintained.

Other Advantages

These methods of deburring have other advantages than the fast re-

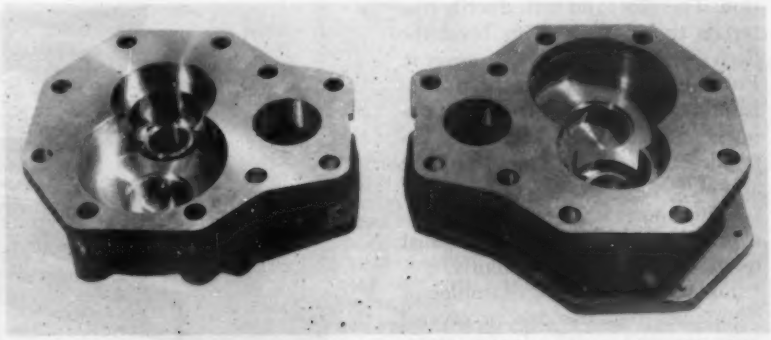


FIG. 2—Typical piece before (left) and after (right) deburring in a barrel finishing machine at Pesco Division.

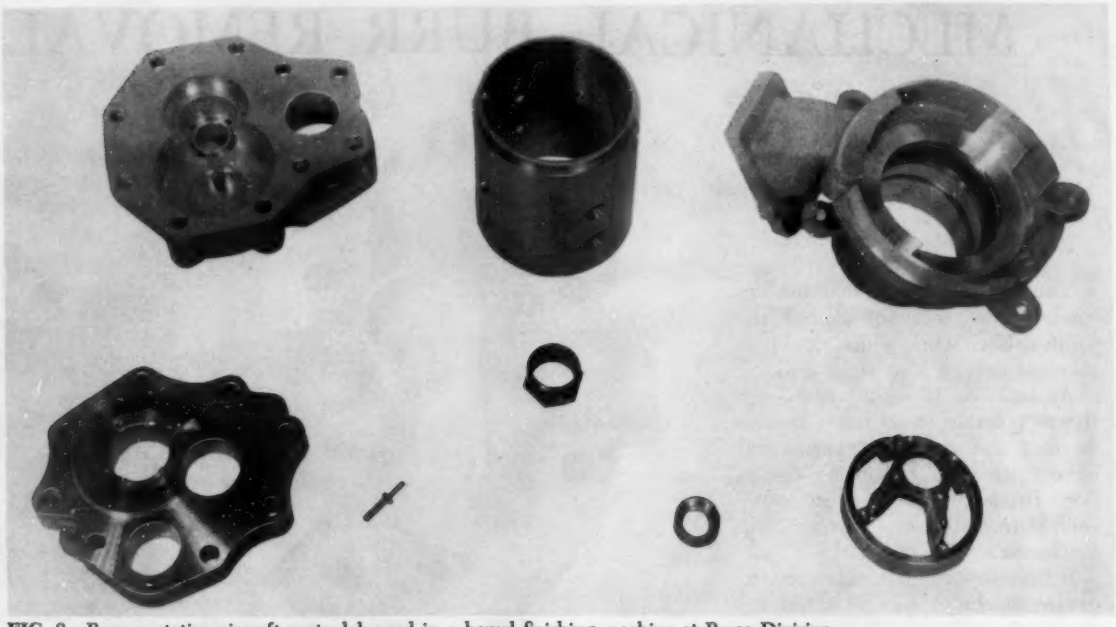


FIG. 3—Representative aircraft parts deburred in a barrel finishing machine at Pesco Division.

moval of burrs and vestigal flash. Some of these are:

1. Imparts uniform surface ideal for bonding paint and other coatings or preparation for finishing processes, such as anodizing.

2. Reveals defective parts by raising laminated areas and making them easily visible.

3. Compression effect on outer surfaces to reduce porosity.

4. Facilitates positioning of parts in machining jigs and fixtures due to absence of flash not cut off by trimming dies.

Each of the methods for removing burrs has its particular place which is determined by the material on which the work is done and the type of imperfection to be removed.

Airless blast and wet blast methods depend on impact for their action. Therefore, on soft, ductile materials they will tend to bend the flash or burr and not remove it. For these metals either barrel finishing or vibratory finishing methods should be used since they depend on a grinding action for their action.

With more brittle metals, however, the airless and wet blast methods work very efficiently.

Following are some examples of companies that use one or several burr removal methods for processing large numbers of parts.

AIRLESS BLAST METHOD

Amplex Division of Chrysler Corporation uses airless blasting equipment for deburring (or deflashing) in the manufacture of powdered metal parts. The parts are made of virtually all types of metal, including powdered iron, bronze, etc. They are relatively small—bearings, ball retainers, gears, etc.

The burrs removed by the airless blasting equipment do not result from tooling, but are "parting line" burrs, resulting from press operations involved in the manufacture of parts by the powdered metal process.

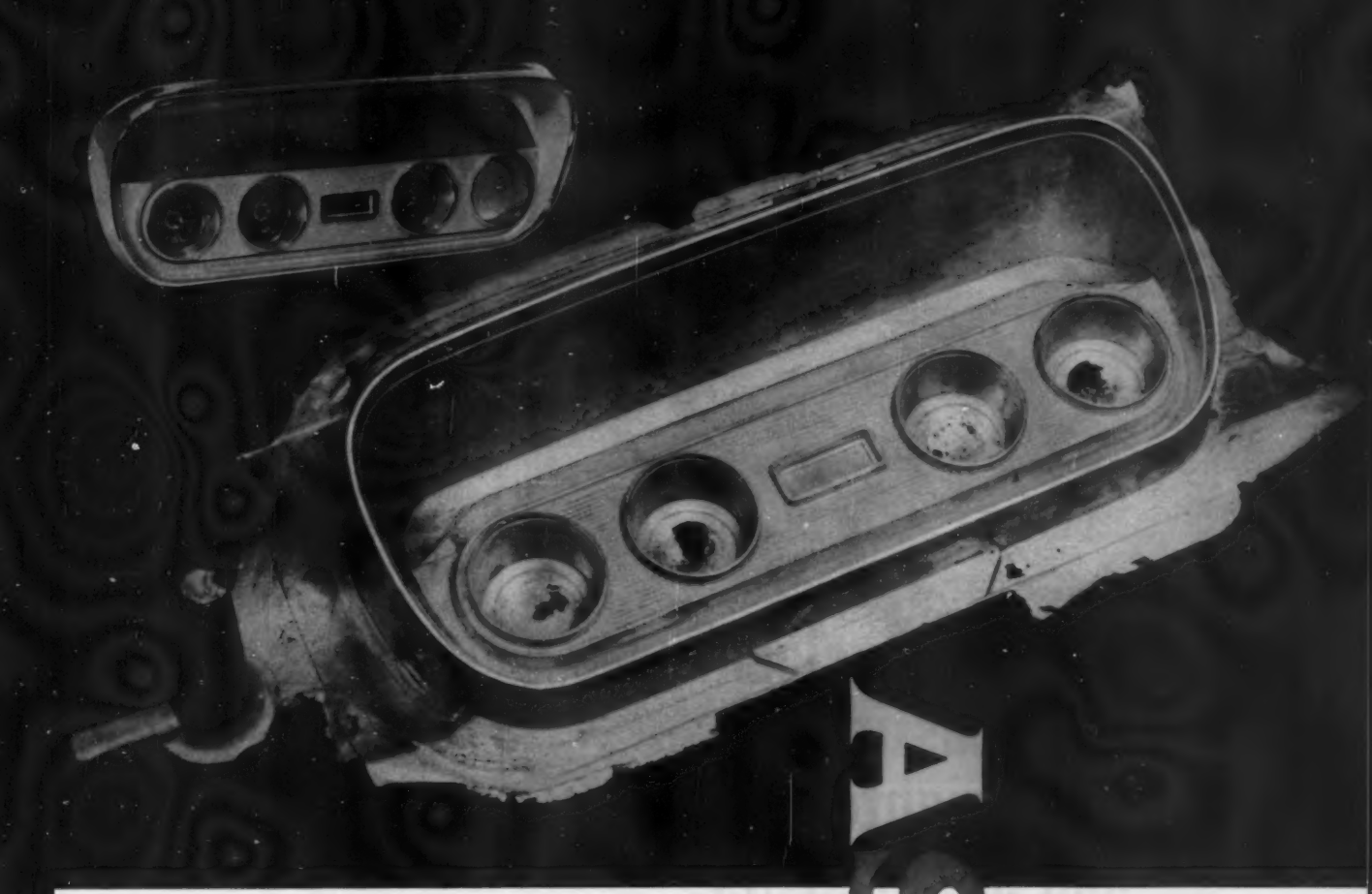
Amplex also has several different types of barrel finishing equipment. Complete deflashing cycles average 8-10 minutes per typical load in 2 cu. ft. machines. A load will include from several hundred to several thousand pieces.

At AC Spark Plug Division, General Motors, Flint, two different types of airless blast equipment are used for a variety of deburring and related operations in the manufacture of engine parts such as oil filters and fuel pumps.

Two automated units are employed to remove flash or fins from aluminum die castings before subsequent machining operations. One of these machines is actuated on a time sequence, the other employs a weight-sensing device.

Another unit at AC is used for deburring a magnesium die casting for the fuel pump body. The

FIG. 4—Vibrator finishing machine with a 5.7 cu. ft. load capacity.



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Low machining costs, superior castability, and an excellent plating surface are the big reasons why zinc die castings are favored for fuel pumps, carburetors, grilles, lamp housing, instrument panels, horn rings, and many other functional and decorative automotive components.

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Three stages in the finishing of a zinc base die casting. Casting at left was buffed. Center casting was buffed and electrocleaned in Oakite 195. Casting at right was buffed, electrocleaned in Oakite 195, and plated. Note that center casting retains full buffed lustre and color after its electrocleaning in Oakite 195.

New electrocleaner for zinc die castings assures brighter plate... and cuts rejects!

Plating of zinc base die castings now becomes a more dependable, more economical operation with the introduction of Oakite 195, a *non-etch* anodic cleaner.

More dependable because the casting surface is not etched and its color not changed or darkened. Soils and films are effectively removed, yet the castings retain their buffed lustre. To help further in preparing the way for uniformly good plating results, this new electrocleaner has excellent rinsability in hot or cold water, and low foaming tendency.

And more economical by far, because of the sharp reduction in rejects due to poor pre-cleaning.

Oakite 195 can be used with direct, reverse and periodic reverse current, in still tanks and fully automatic set-ups. Where only a single solution tank is available, it is being used to clean a variety of metals—zinc, steel, brass, copper.

For more information about this important new development in cleaning before plating, write for descriptive folder F-10466 to Oakite Products, Inc., 34G Rector Street, New York 6, N. Y.

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years' leadership in industrial cleaning

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BURR REMOVAL *(cont.)*

matte finish imparted to the magnesium die castings by the aluminum media proves a useful bonding aid for the resin coating which is applied after blasting.

A fourth airless blast unit at AC is used to remove external burrs from zinc fuel strainer castings. The zinc shot abrasive "smears" the surface, practically plating it to improve corrosion resistance, finish, and appearance.

BARREL FINISHING

At the Pesco Division of Borg-Warner Corporation, Cleveland, Ohio, approximately 18,000 different parts are manufactured. They include the wide variety of parts used in many types of pumps, motors, fans, and electro-hydraulic servo valves. About 70% of these parts are barrel-finished. Deburring is usually involved, and many parts are also polished or burnished.

Small valves are often finished in quantities of 5,000 to 10,000 to a batch, while larger pieces are often processed one or two at a time. Five barrel finishing machines, include, single, double, and 10-compartment units, with total capacity of approximately 50 cu. ft.

Time savings have been impressive. Barrel-finishing a pump housing, for example, takes less than half the former handfinishing time. Loading, unloading, and related operations are included in the barrel-finishing time-saving.

At Hermaseal Company, Inc., Elkhart, Indiana, electronic components are deburred in a barrel finishing machine. The company formerly jobbed out its deburring, but since installing the 3-barrel machine, have reduced finishing costs by at least 25%, and improved surface quality has reduced the number of rejects in glass sealing.

VIBRATOR

Vibrator finishing, a process developed within the last five years, has proved to be a "natural" for mechanical deburring.

Vibratory equipment accomplishes other steps, but in 36 of 43 installations with more than 50 vibrators, deburring is one of the purposes for which the equipment was purchased.

continued on page 75

PORCELAIN ENAMELED

ANODIZED & DYED

CAN DIE CASTINGS BE ANODIZED?

ACCORDING TO Hamilton Die Cast, Inc., Yes. They have a new aluminum alloy which they say can be color anodized, porcelain enameled, inert-arc welded with compatable rod, and dip brazed. The alloy must be vacuum cast, but that's the only difference in procedure.

How about strength of the new alloy. According to Hamilton Die Cast here are typical as-cast properties.

Ultimate Tensile	37,000 psi
Tensile yield	24,000 psi
Elongation in 2"	5½%

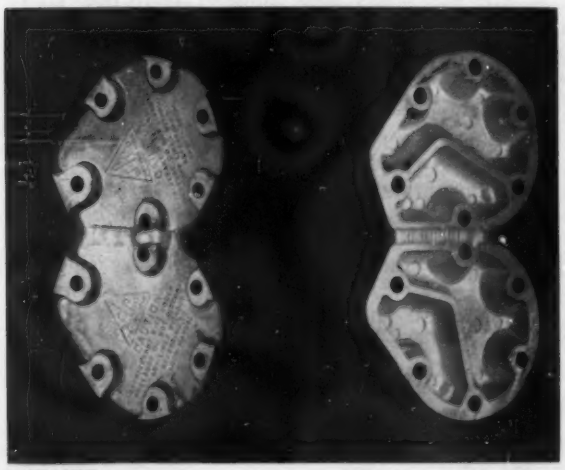
Machineability is reported as excellent, better than present die castable alloys. The castings have an internal structure somewhat coarser than normal, but the chilled skin is thicker, estimated at 0.020".

Anodizing requires a modified procedure which has been worked out.

Porcelain enameling is done with one of the new Du Pont low fired enamels, temperature about 1000°F.

Welding is with heli-arc. The work is done with a #26 Airco rod under argon at 10 cu. ft. per min.

Dip brazing has been successfully done by preheating for 30 min. at 950°F and then braze in a salt bath at 1050°F using 719 Alcoa wire. The brazed structure is air cooled and cleaned.



WELDED

DIP BRAZED

USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications free by circling the numbers on the Reader Service Cards facing Page 70

PROCESSES

145 **Investment Castings** — HUMPHREY CASTINGS, INC. — 34-page facilities brochure explains the investment casting process and shows some of its applications.

146 **Castings** — BENDIX FOUNDRIES — Brochure shows the engineering services available and discusses the applications of the various casting processes.

147 **Sinterings** — AMERICAN SINTERINGS DIV. — Brochure shows the facilities and services for producing high density sinterings.

148 **Extrusions** — JANNEY CYLINDER CO. — 4-page technical brochure discusses the extrusion and die forging process and their applications for nonferrous alloys.

149 **Investment Castings** — BRUSH BERYLLIUM CO. — Technical brochure on the applications and properties of beryllium copper investment castings.

150 **Castings & Extrusions** — DOW CHEMICAL CO. — 12-page technical booklet shows facilities for casting and extruding, discusses design considerations and alloy properties.

21 **Investment Castings** — DEAN CASTING & MFG. CO. — Brochure lists the applications and advantages of the Acrocast investment casting method.

152 **Continuous Casting** — AMERICAN SMELTING & REF. CO. — 8-page technical booklet on continuous cast, copper base alloys includes tables of alloy properties and specifications.

153 **Die Castings** — SYRACUSE DIE CASTING & MFG. CO. — 4-page brochure shows the die casting and finishing facilities available.

MATERIALS & EQUIPMENT

158 **Fire-Resistant Fluids** — E. F. HOUGHTON & CO. — 6-page booklet on fire-resistant fluids which provide outstanding wear resistance.

159 **Iron Powders** — PYRON CORP. — 8-page technical manual lists the engineering properties of hydrogen reduced iron powder.

160 **Radiation Pyrometer** — WEST INSTRUMENT CORP. — Bulletin describes the West-Land radiation pyrometers which provide continuous direct readings.

161 **Hydraulic Pumps** — DENISON ENGINEERING DIV. — 8-page technical booklet describes the performance characteristics and applications for axial piston hydraulic pumps.

162 **High-Purity Gases** — LINDE COMPANY — 16-page technical booklet discusses the properties, applications and storage of ultra-high-purity gases.

163 **Refractories** — HARBISON-WALKER REFRACTORIES CO. — 8-page booklet describes a complete line of refractory materials.

164 **Vacuum Pumps** — LEIMAN BROS., INC. — 32-page catalog lists performance curves, specifications and uses for air and vacuum pumps, gas boosters and air motors.

165 **Wax Injection Press** — ALEXANDER SAUNDERS & CO., INC. — Data lists the specifications and uses for the Sherwood wax injection press for the volume production of large patterns.

166 **Die Casting Dies** — DETROIT MOLD ENGINEERING CO. — External house organ discusses the advantages of standardized die casting dies.

167 **Tantalum & Molybdenum** — FANSTEEL METALLURGICAL CO. — External house organ presents case histories and engineering data on the use of tantalum and molybdenum.

168 **Vacuum Pumps** — CONSOLIDATED VACUUM CORP. — 6-page brochure gives performance curves, specifications and the principle of operation for a line of mechanical vacuum pumps.

169 **Sintered Cobalt** — COBALT INFORMATION CENTER — Technical report on nonmetallic dispersions in sintered chromium-cobalt alloys.

170 **Equipment Leasing** — ACME ASSOCIATES, INC. — Booklet tells how to stretch working capital by leasing new machinery and equipment.

171 **Casting Alloys** — ALLOY CASTING INSTITUTE — Booklet describes 46 technical publications on stainless and heat resistant castings.

172 **High-Temperature Materials** — ZIRCONIUM CORP. OF AMERICA — 4-page brochure on zirconium oxides and other high-temperature materials includes a list of standard shapes available.

173 **Diamond Grinding** — ENGELHARD HANOVEA, INC. — External house organ discusses the advantages of finish grinding, honing and lapping with natural diamond compared to other abrasives.

174 **Cobalt Alloys** — WAIMET ALLOYS — Technical data tells how modifications to cobalt base alloys reduced metal costs for investment casting by 33%.

175 **Casting Alloys** — LEBANON STEEL FOUNDRY — Reference chart gives data on the properties and applications of 55 alloys commonly used for casting.

176 **Copper Alloy** — AMERICAN METAL CLIMAX, INC. — 8-page technical booklet lists the engineering properties and applications for a free-machining, copper alloy with good workability and high conductivity.

177 **Thermocouple Assemblies** — MINNEAPOLIS-HONEYWELL REGULATOR CO. — 40-page catalog lists the prices and specifications of over 100 complete thermocouple assemblies.

178 **Vacuum Pumps** — CONSOLIDATED VACUUM CORP. — Bulletin describes two high-speed vacuum diffusion pumps which maintain peak speeds over longer pressure ranges.

continued on page 60

MONO-SHELL Process Casts LARGE and COMPLEX Units Economically!

The Valve Body produced by Misco for this Jet Engine Pressure Regulator, manufactured by The Garrett Corporation's AiResearch Manufacturing Division, Phoenix, Arizona, is another example of the flexibility of our MONO-SHELL Process. This complex Valve Body has an inside diameter of 3¾", an outside diameter overall of 6½", and a length of 5½". MONO-SHELL has removed former size limits and even larger and more complex units than this can be cast.

This Pressure Regulator and Shutoff Unit, incorporating fail-safe features, handles bleed air for system use from the powerful jet engines of the Douglas DC-8, automatically regulating this air to 38 psig. Attached to the last stage of the compressor of the powerful commercial jet engine, this AiResearch automatic unit may also be operated remotely by the pilot. Sensing pressure to limit flow, the unit prevents the system from demanding too much air. In event of an engine shutdown the unit locks to prevent reverse flow, which would cause engine windmilling.

AiResearch is a pioneer in the field of aircraft, missile and spacecraft valves, systems and controls. Today nearly every military and commercial aircraft in the free world uses multiples of AiResearch systems and controls. Misco's engineering and production facilities have met AiResearch's exacting requirements for various components.

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PERMANENT MOLD
Aluminum Alloys-High Purity Alloys

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Aluminum Alloys-Zinc

SAND FOUNDRY
Aluminum Alloys-High Purity Alloys
Brass-Bronze-Monel

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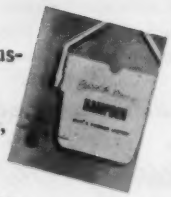

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Complete Pattern, Machine, and Die Shops . . .
X-Ray and Laboratory . . . Heat Treat and Wheelabrator facilities

Circle No. 27 on Reader Service Card

USEFUL LITERATURE *continued from page 58*

179 **Sintering Furnaces** — GENERAL ELECTRIC CO. — 4-page bulletin on the specifications and features of mesh-belt furnaces for copper sintering.

180 **Die Lubricant** — E. F. HOUGHTON & CO. — Data sheet on Mouldlubric 3113 die lubricant for zinc and aluminum die casting.

181 **Heat Radiation** — GRANCO INC. — 12-page booklet discusses the transfer of heat by infra-red radiation with reference to the Granco irradiant gas grid.

182 **Material Testing** — PHILIPS ELECTRONIC INSTRUMENTS — 12-page booklet gives data on X-ray units for non-destructive material testing.

183 **Thermocouple** — ENGELHARD INDUSTRIES, INC. — Information on a refractory metal thermocouple combination for temperature measurements in vacuums, hydrogen or inert gases.

184 **Tool Steel** — UDDEHOLM CO. OF AMERICA — 8-page pamphlet contains engineering data on a water hardening, vanadium alloyed tool steel for the cold-heading industry.

185 **Die Lubricant** — ACHESON COLLOIDS CO. — Information and free sample of "dag" 206, a dispersion of molybdenum disulfide in water which makes a die lubricant of optimum stability.

186 **Air Blow Gun** — E. V. NIELSEN INC. — Descriptive literature on an air blow gun which prevents the flyback of chips and dust when cleaning machines.

187 **Recorder** — MINNEAPOLIS-HONEYWELL REGULATOR CO. — Bulletin describes a recorder which can be converted in seconds to measure from 2 to 24 points, useful in applications where the number of records is changed frequently.

188 **Heat & Air Systems** — GRANCO, INC. — 12-page booklet describes a line of ovens, furnaces, material handling systems and air supply systems.

FINISHING

Vacuum Heat Treating — IPSEN INDUSTRIES, INC., 731 So. Main St., Rockford, Ill. — 50-page manual for $2.00 discusses the considerations applying to heat treating furnaces and the various techniques of vacuum metallurgy.

193 **Color Applicator** — ACROMARK CO. — Data sheet describes a machine for applying enamel or ink into depressed lettering or design.

194 **Heat Treating Furnace** — GENERAL ELECTRIC CO. — 4-page bulletin describes the features and advantages of a refractory-free, radiation shield vacuum furnace for critical heat treating.

195 **Vibration Finishing** — CONVEYOR CORP. — 6-page booklet on a unit for the vibration finishing of ferrous and non-ferrous parts in continuous or batch automated cycles.

196 **Deburring** — JANCY ENGINEERING CO. — Data sheet on a tool for deburring, chamfering, and countersinking which leaves a clean, chatter-free finish.

197 **Painting Machine** — CONFORMING MATRIX CORP. — Brochure describes a pressure contact, spray painting machine with enlarged plenum chamber, variable speed oscillation and spraying time.

198 **Vibratory Finishing** — ALMCO QUEEN PRODUCTS DIV. — 8-page booklet lists the specifications and applications for a line of vibratory finishing machines and finishing media.

199 **Metal Finishing** — ALLIED RESEARCH PRODUCTS, INC. — Information on 6 new metal finishing processes for corrosion protection, paint base preparation, final finishing of non-ferrous metals and other applications.

200 **Automatic Finishing** — MURRAY WAY CORP. — 6-page brochure discusses a line of automatic equipment for buffing, polishing, grinding, filtering and coating.

201 **Magnesium Coating** — MAC DERMID INC. — Data sheet describes a dry chromate base salt used in water solution to produce a corrosion resistant coating on magnesium.

203 **Barrel Media** — LORD CHEMICAL CORP. — Bulletin shows a table of screen mesh sizes and case histories for a natural mineral, barrel finishing media.

204 **Copper Electroplating** — BECCO CHEMICAL DIV. — Information on a process for preparing copper for electroplating which greatly reduces the porosity of thin electrodeposits.

205 **Mechanical Finishing** — ACME MFG. CO. — 6-page booklet shows Acme's progress over the past 50 years in the development of equipment for mechanical metal finishing.

206 **Platinum Anodes** — SEL-REX CORP. — Technical data on platinum-ized titanium-mesh anodes which are functionally equal to solid platinum at one tenth the cost.

207 **Chromium Reducer** — MAC DERMID INC. — 2-page usage and instruction sheet on a chromium reducer for use in alkali cleaners and copper plating solutions.

208 **Welding** — ALUMINUM CO. OF AMERICA — Technical brochure specifies the correct filler alloys for welding all recommended wrought alloy parent metal combinations.

209 **Brazing Preforms** — LUCAS-MILHAUPT ENGINEERING CO. — 20-page technical booklet shows examples and design considerations for brazing metal joints with alloys in preformed shapes.

210 **Tapping** — TAPMATIC CORP. — Brochure describes the Tapmatic tapping attachment which provides positive adjustable torque control.

211 **Copper Finishing** — LEA MFG. CO. — Data sheet tells how to abrasive finish electrodeposited copper to achieve specific results.

212 **Painting Masks** — CONFORMING MATRIX CORP. — Information on the development of vertical fixtures for applying color decoration to mass produced parts.

213 **Buffs** — HANSON-VAN WINKLE-MUNNING CO. — Data on the advantages of buffing wheel cloths impregnated with the same binder used in buffing compounds.

214 **Deburring** — WHEELABRATOR CORP. — 4-page folder discusses the application and advantages of various methods for mechanical deburring.

215 **Metal Deburring** — LORD CHEMICAL CORP. — 6-page bulletin on a complete line of vibratory, barrel, and wet blast finishing equipment.

A WINNING COMBINATION for your DIE CASTINGS

EXPERIENCE —

is the first prerequisite for quality die castings. Our staff of expert designers, engineers and production men have the know how and experience of over 31 years in the industry to save you money while turning out top quality castings.

GUARANTEED QUALITY —

As a licensed producer of die castings under the Certified Zinc Alloy Plan, you can be sure that your zinc castings conform to the strict chemical composition limits for maximum mechanical and physical properties.

PROGRESS —

Our participation in the Die Casting Research Foundation is our way of contributing to the future development of the die casting process and its usefulness as a metal working method.

For quality, service and economy, the above symbols are your guide to the best in die casting in the Midwest.

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FIREDIE (type H11)

The first choice of leaders in hot work production

Product of Skilled American Workmen

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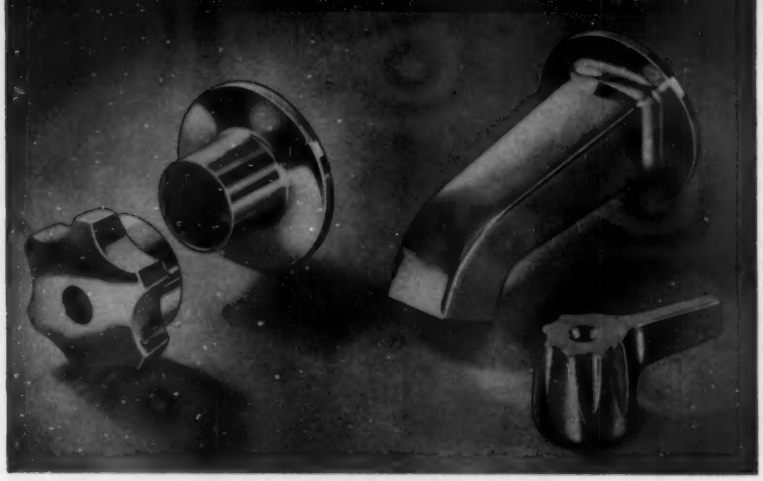
QUALITY is a FIXTURE at L.D.C.



. . . and these fine finish plumbing fixtures tell you why

Quality is fashioned by craftsmanship. Take these sparkling chrome plated zinc castings. Note their modern, graceful lines and soft, smooth finish . . . made possible only by the qualities of purity and surface soundness and uniformity of the alloy; and the rigid maintenance of close tolerances by controlled production methods and equipment.

And here is something else! The serrations for the mating spline in the handles of these fine fixtures are held to close dimensional tolerances by reason of the identical same qualities that govern the economical production of these castings.

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J. M. Gallaher
363 West First St.
Tel: Baldwin 4-3523

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1016 Fisher Bldg.
Tel: Trinity 3-5910

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79 Prospect St.
Stamford, Conn.
Tel: Fireside 8-3985

PHILADELPHIA, PA.
Albert B. Reid
505 Wadsworth St.
Tel: Chestnut Hill 7-8833

Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

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NEW PRODUCTS

(continued)

PNEUMATIC CYLINDER

ALLENAIR CORP. — A pneumatic cylinder with two pistons on one rod provides the advantages of hydraulic control to an air operated cylinder. By using pressure in both sections, the usable force is twice that obtained from the same size standard cylinder.

Circle No. 238 on Reader Service Card

ELECTRICAL OVERLOAD TRIP

DRESSER ELECTRIC CO.—The Instatrip overload tripping device for plating or industrial rectifiers instantly shuts off electrical equipment when the DC load reaches a factory preset percentage of the shunt rating.

Circle No. 239 on Reader Service Card

EXTENSION WIRE CABLE

MINNEAPOLIS-HONEYWELL CO.— Multiple conductor extension wire cable for all thermocouple calibrations is now available as a standard product. The cables come in 16 and 20 gage wire in 4 to 48 pairs twisted with variable pitch.

Circle No. 240 on Reader Service Card

ABRASIVE DISCS

BEHR-MANNING CO. — Pressure-sensitive adhesive discs for metal grinding and finishing are available in clear plastic tubes. The dust-proof, moisture-tight, tubes offer complete protection for unused discs.

Circle No. 241 on Reader Service Card

TAPPING VALVE

INTERNATIONAL FOUNDRY SUPPLY CO. — The Revecon tapping valve permits the exact pouring of aluminum and bronze in measured quantities. Underpouring of the molten metal eliminates turbulence.

Circle No. 242 on Reader Service Card

BARREL FINISHING MACHINE

RAMPE MANUFACTURING CO. — The Model RA4 Rollabrader precision finishes small parts in four, 2-quart barrels at one time. The unit is intended for lapidary work and the deburring and polishing of delicate parts, sample lots, or special process applications.

Circle No. 243 on Reader Service Card

TIME RECORDER

CORRELL & CORRELL — The time utilization meter panel shows when and how long your machines are running. Ten individual meters per panel check the machines' productivity and make sure your employees are on the job.

Circle No. 244 on Reader Service Card

HIGH TEMPERATURE CONTROL

UNITED ELECTRIC CONTROLS CO. — The type E36N high temperature indicator and control unit provides easy reference between the setting and controlling temperatures. The compact, remote bulb units combine accuracy and sensitivity over wide temperature ranges.

Circle No. 245 on Reader Service Card

DIAMOND GRITS

DIAMOND TOOL RESEARCH CO. — Diamond grits and micron sized abrasive powders are quality pretested by the way they are produced. Extreme pressures break rough diamonds repeatedly until only sturdy grains are left. As a result, they last longer, cut smoother and permit closer grading.

Circle No. 246 on Reader Service Card

BILLET BUNDLING MACHINE

LOMA MACHINE MFG. CO., INC.— Extrusion billets are packaged into uniformly shaped, tight bundles by an automatic bundling machine. Round billets are bundled in a hexagonal pattern, and square bars are stacked in a square arrangement. The machine can be adjusted for a different billet size or stacking pattern in minutes.

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WHETHER YOUR PART IS LARGE OR SMALL

HIGH GREEN STRENGTH IS IMPORTANT

VASCO PREALLOYED METAL POWDERS

You get the all-important high green strength you need in improved VASCO stainless steel powders, *prealloyed for performance.* Better molding qualities make our stainless powders now almost as easy to press as simple iron powders . . . provide greater green density . . . permit the manufacture of more intricate parts . . . and afford better strength and ductility as well. Sintering conditions are within the range of standard equipment. Write for Data Sheets!

VA

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POWDER METALLURGY DEPARTMENT

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MOLDABLE EXOTHERMIC COMPOUNDS—for increased yield and feeding efficiency	Feedex®	For all metals and alloys
RISER HOT-TOPPING COMPOUNDS—Insulating/exothermic Exothermic/metal producing	Feedol Ferrux Kalmex	Aluminum and copper base alloys Iron and steel Iron and steel
PROTECTIVE AND DROSSING FLUXES—for reducing metal loss and eliminating oxide inclusions	Coveral Cuprit Albral Plumbral Zinc Coveral Plumbrex	Aluminum base alloys Copper base alloys Aluminum, manganese and silicon bronze alloys High leaded bronze Zinc base alloys Lead base alloys
DEGASSERS—for cleansing and removal of harmful gases	Degaser Cuprex Logas Regenerator Ferrogen	Aluminum and magnesium alloys Copper and nickel alloys Copper and nickel alloys Copper and nickel alloys Gray, malleable and high nickel cast iron
DEOXIDIZERS—for controlled deoxidation and increased fluidity	Deoxidising Tubes	Copper base alloys
GRAIN REFINING COMPOUNDS	Nucleant	Aluminum base alloys
COATINGS—for cores, molds, dies, tools, ladles	Moldcote Terracote Terrapowder Firit	Volatile type core and mold coatings for all metals Water base mold and core coating for iron and non-ferrous metals High quality graphite-refractory coatings For ladles and furnace tools
MISCELLANEOUS	Ladelloys Corfix CO_2 Set Inoculant	Alloying additives for iron and steel Core joining compound Core and mold binder for use in CO_2 process Inoculating compound for iron

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INDUSTRY NEWS *(continued)*

NEW OFFICERS AT I.P.C.

AURBACH

JOSEPH

Lester P. Aurbach has been elected president and Edwin M. Joseph executive vice president of PRECISION METAL MOLDING's publisher, The Industrial Publishing Corporation. Aurbach, until now executive vice president of our 30-year old company, recently celebrated his 25th anniversary with the firm. He succeeds Irving B. Hexter who died recently. Aurbach joined The Industrial Publishing Corporation in 1935, was appointed vice president three years later, executive vice president in 1952.

Joseph joined the company in 1945 as general manager of OCCUPATIONAL HAZARDS magazine. He was named a vice president in 1952 and first vice president in 1959.

BONNER JOINS DIXON CRUCIBLE

Joseph T. Bonner has joined the industrial division of the Joseph Dixon Crucible Company, Jersey City, N.J., as a lubrication engineer.

He will assist industrial salesmen in developing colloidal graphite accounts field test new products and their applications, and supervise and develop technical bulletins and literature dealing with products manufactured by the company, which include industrial lubricants, paints and crucibles.

FASTER, MORE ECONOMICAL PROCESS FOR EXTRUDING

The Metals Division of the H. M. Harper Company, Morton Grove, Illinois, has developed, through the use of the Ugine-Sejournet glass lubrication process, a new manufacturing technique which reduces cost and speeds up the production of steel and stainless steel extruded shapes.

According to H. M. Harper, president, the company has succeeded in completely eliminating one of the most time-consuming steps in shape forming—the process of rolling.

He explained that conventional techniques involve casting large ingots and reheating and rolling them to smaller sizes. These are then recut into still smaller sizes, reheated and rolled again. This process of diminishing sizes by heating and rolling continues until finally the material is rolled into the desired size and shape.

In the new technique, developed by the H. M. Harper Company after four years of research, smaller ingots in the range of 5½ to 7½ inches are processed directly by extrusion from the cast material into the finished shape, without the necessity of rolling.

Harper said the new process, although substantially reducing both costs and time required to manufacture a completed shape, produces a finished product with as much tensile strength, or more, than those made by the conventional hot-rolling method.

METAL FINISHERS TO MEET IN LOS ANGELES

The National Association of Metal Finishers will hold its annual convention in Los Angeles, July 22-25. Host for the visiting delegates will be the Metal Finishing Association of So. California. Headquarters for the meeting is the Statler-Hilton hotel. In addition to technical and business sessions, a program of entertainment has been planned.

The NAMF convention just precedes the AES meeting, also in Los Angeles, so that metal finishers can attend both meetings.

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SYNCLINAL FILTERS

FOR DEPENDABLE PROTECTION on all Hydraulic and other low pressure circulating systems

Designed to give more ACTIVE filtering area—MORE dependable protection—MORE productive operation before cleaning is necessary. *Meet J.I.C. Standards.*

A

B

A—Synclinal SUMP TYPE
CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not available.

B—Synclinal LINE TYPE
CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
BY-PASS VALVE: Not available.
OPERATING PRESSURES: Up to 80 p.s.i.

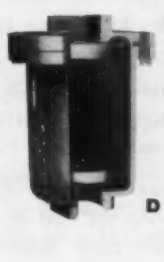
C—Bonded LINE TYPE
CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1½"—1½"—2" and 2½".
BY-PASS VALVE: Available with or without.
OPERATING PRESSURE: Up to 250 p.s.i.
OPERATING TEMPERATURES up to 300° F.

D—IN-LINE FILTER
CAPACITIES: Up to 60 G.P.M.
PIPE SIZES: ¾"—1"—1¼" and 1½" (at both inlet and outlet).
BY-PASS VALVE: Available with or without.

E—Bonded SUMP TYPE
CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1½"—1½"—2" and 2½".
CONNECTIONS: Coupling—"O" Ring—Male Nipple.
BY-PASS VALVE: Available with or without.

F—Tandem SUMP TYPE
CAPACITIES: 10—16—20—40—60—100—150 and 200 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not available.

C


D

E

F

FILTERING MEDIA in all Marvel Filters is Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your filtration requirement.
EASY TO CLEAN—All Marvel Filters are easy to clean. Line type units operate in any position and may be serviced without disturbing pipe connections.
OVER 900 O. E. M's. install Marvel Filters as Standard Equipment.

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Please send me information on Marvel Filters as indicated: PMM-7

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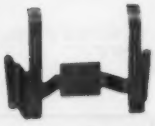
Die Castings
AT WORK
No. 4 of a Series.

PARAMOUNT Die Castings reduce parts to only 3 in this Wheelock signal housing

BEFORE: Housing back box was a steel stamping to which were welded **ten separate** pieces.

NOW: Box is a **one-piece** Paramount aluminum die casting with these pieces **cast integral.**



BEFORE: Bracket for holding signal mechanism consisted of a **six-piece** steel weldment.

NOW: Bracket is a **one-piece** Paramount aluminum die casting.

BEFORE: Grilled front proved difficult for other die casting companies to produce to Wheelock's rigid specifications.

NOW: Paramount is consistently meeting the high quality standards, at lower cost, and makes deliveries on schedule.

Result: Through Paramount's engineering and production "know-how", Wheelock Signals, Inc. is now saving the cost of handling, welding, drilling and inventorying the many parts required by the former design — tremendous savings each month.

It Will Pay You To Look to Paramount . . .

No matter what your product, if you are considering redesign for die castings, or if it already incorporates die castings, it will pay you to investigate Paramount's complete die castings service.

THREE COMPLETE PLANTS— TWO IN ST. JOSEPH, MICHIGAN, ONE IN SEYMOUR, INDIANA

SEND FOR THIS HELPFUL BROCHURE AND "DESIGNING FOR DIE CASTING"

RESEARCH PARTICIPANT

PARAMOUNT *Die Casting Co.*
(A subsidiary of TALON, INC.)
ST. JOSEPH, MICHIGAN

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AMPI FORMS PHILADELPHIA CHAPTER

The American Powder Metallurgy Institute announces the formation of a Philadelphia Section.

The first meeting was on March 31 at The Engineers' Club in Philadelphia. The next meeting was on the evening of Tuesday, May 17, at the same location.

The American Powder Metallurgy Institute is the technical division of the Metal Powder Industries Federation and was just opened to individual membership.

Headquarters of the Institute are at 60 East 42nd Street, New York 17, N.Y. Executive Secretary is Kempton H. Roll, who also serves in this capacity with the Federation. National President of the Institute is Robert C. Burgess, Vice-President of Burgess-Norton Manufacturing Co.

Dues are $10 per year in the U.S. and Canada; $15 elsewhere.

Officers and Executive Committee of the new Philadelphia Section are Robert Hendren, Chairman; George Karian, First Vice-Chairman; Samuel Bradbury, Second Vice-Chairman; Robert Powell, Secretary; Hampton Silcox, Corresponding Secretary; and, Robert Bouman, Treasurer.

NEW FACILITIES FOR METALS & RESIDUES

Metals & Residues, Incorporated, manufacturers of refractory metals, announces the installation at their Springfield plant of additional new reduction facilities utilizing the Supiro Process for the production of high grade tungsten and molybdenum powders. The new equipment has effected a tenfold increase in M & R's production capacity.

As a result, M & R has discontinued its operation of the Johnston & Funk Metallurgical Corporation's reduction facilities in Huntsville, Alabama where the Supiro Process had been successfully employed for the past year.

Zere B. Lile, M & R's former Huntsville representative, has been transferred to Springfield where he has been put in charge of the company's reduction department.

DE VILBLISS APPOINTMENT

The appointment of D. L. Bohon as manager of industrial sales for The DeVilbiss Company has been announced by H. M. Kidd, vice president-sales.

E. F. Frey, who has been manager of industrial sales, will continue to serve as sales liaison officer between the industrial and jobber sales divisions and take on the additional duties of correlating sales efforts on DeVilbiss Metal Fabricators products. The latter are manufactured by a subsidiary company, engaged in the custom manufacture of ovens, spray booths, dip coaters, flow coaters, spray and dip washers, dust collectors, air replacement and other components of finishing systems, and is headquartered in Detroit.

APPOINTED ASSISTANT TO PRESIDENT

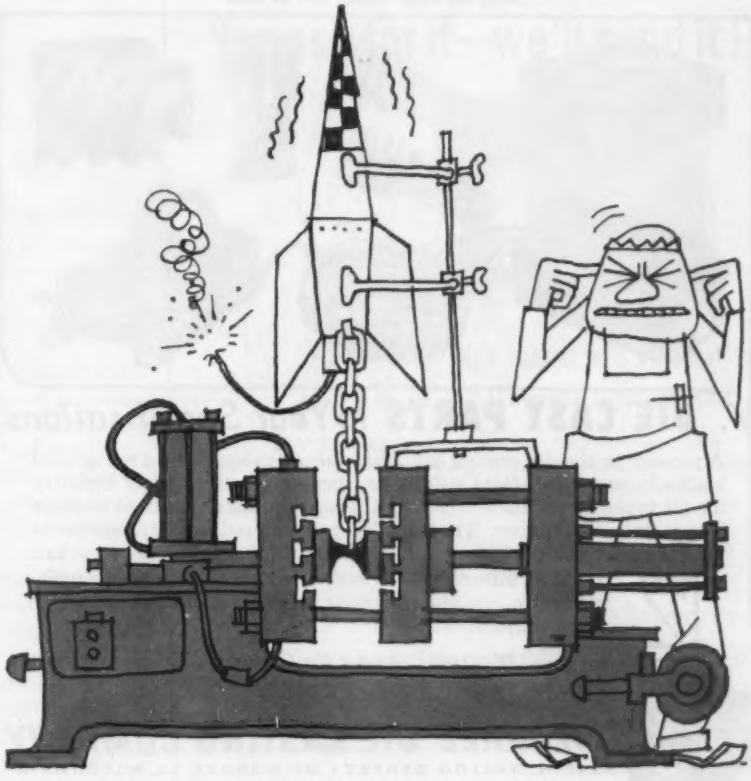
Theodore R. Kennedy became Engineering Assistant to the President, Inductotherm Corporation, 412 Illinois Avenue, manufacturers of high-frequency induction heating and melting equipment.

Mr. Kennedy, a registered Professional Engineer and holder of many patents, brings with him a lifetime of engineering experience in the induction heating field. Prior to joining Inductotherm, he had been Chief Engineer of Magnathermic Corp. For many years, Mr. Kennedy had been with Ajax Electrothermic Corp., where he had worked closely with Dr. E. F. Northrup, inventor of the high-frequency coreless induction furnace, and rose to the position of Chief Engineer.

ENTHONE EXPANDS WAREHOUSING

Enthone, Inc., has doubled its warehousing facilities in New York State with the establishment of a complete stock of chemicals in Syracuse. This is in addition to the Binghamton warehouse of Austin F. Fletcher, Inc., Enthone distributor.

The Syracuse warehouse will serve the Rochester-Syracuse-Utica area while Austin F. Fletcher, Inc. will continue to serve the Binghamton-Elmira area.



Don't countdown stuck castings...use Die Slick!

If you want to achieve virtually continuous die casting production, you should investigate these two Die Slick compounds: Die Slick No. 9X, for zinc, thins with water to keep your machine ejecting clean castings shot after shot. Die Slick No. 44, for aluminum, thins with water or solvent to eliminate stuck castings, scoring and soldering. Both can be used in a spray gun—and because they thin with water there's almost no smoke.

Water-thinned Die Slick saves you money in several ways. First, you don't need expensive thinners. Second, you eliminate the fire hazard. Third, you save storage space. Send for a trial quantity today . . . either No. 9X for zinc or No. 44 for aluminum. If you don't like it, you don't pay for it, of course.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

for 20 years

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,

1703 SPAULDING ROAD, DAYTON 32, OHIO

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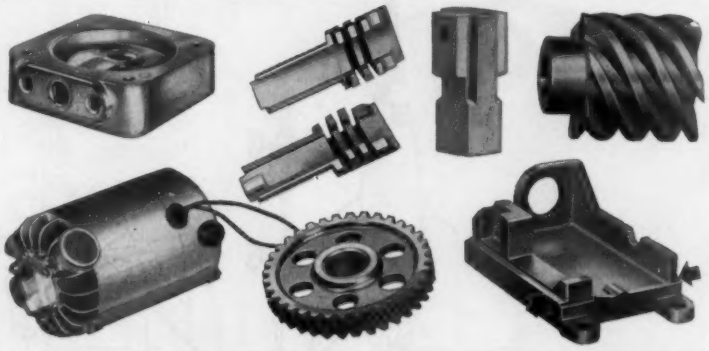


DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

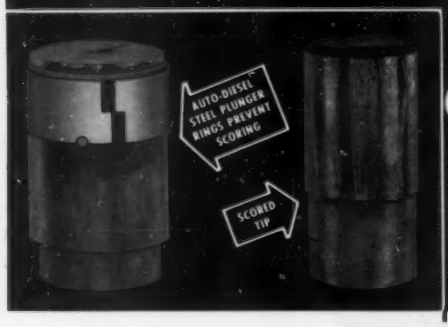
We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY

4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN

Established 1909

NEW TIP & RING PLUNGER COMBINATION



6 MONEY SAVING ADVANTAGES

Greater Efficiency

Solves problem of scored or worn tips—saving thousands of dollars per year for the die casting industry.

Beryllium copper and steel plunger rings on piston tips result in maximum service life.

1. Longer wear
2. Denser castings
3. Eliminates aluminum pick-up on sleeves
4. Reduces tip changing down-time
5. Eliminates buying or making new tips
6. You can salvage and use your old tips

Catalog on Request

Plus—Auto-Diesel now offers stainless steel liners for goosenecks—increasing present life 4 to 1—literature on request.

THE AUTO-DIESEL PISTON RING CO.

3141 Superior Avenue • Cleveland 14, Ohio

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SMELTERS ASK FOR EXPORT CONTROLS

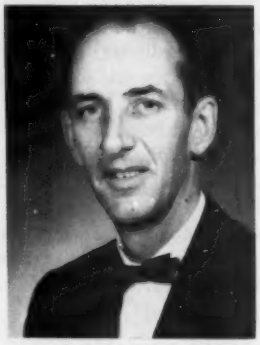
Upon disclosure of figures showing a 246 per cent increase in scrap aluminum exports for the first quarter of 1960 over the same period last year, the aluminum smelting industry has renewed its appeal to the U.S. Department of Commerce for export limitations.

A letter written by Carl H. Burton, secretary of the Aluminum Smelters Research Institute, to Carl F. Oechsle, assistant secretary of Commerce, emphasized that the large increase in exports represents "a serious drain of stategic materials, posing a threat to domestic industry."

In response to a request by ASRI last summer, the Commerce Department had said that "export limitations are not warranted at this time," but had agreed to maintain close watch over the tonnage flow.

However, Burton pointed out that shipments so far in 1960 are averaging approximately 11 million pounds per month.

FERRO APPOINTS GRANQUIST



GRANQUIST

The appointment of Paul I. Granquist to head the newly opened Chicago area office of Ferro Powdered Metals was announced by R. A. Bagby, Manager of Sales and Marketing. Mr. Granquist's engineering experience includes castings, molded and machined parts, to conform to Ferro Powdered Metals' policy of furnishing complete engineering service.

more industry news, page 72

THE SINTERINGS

Continued

addition to sizing, this operation also increases the strength of the parts.

IMPREGNATING

The bushings are impregnated with oil by soaking them for 2 or 3 hours in oil at 170°F. They are allowed to drain for 1 hour and are then ready for use.

Some of the bushings are cast-in during die casting. These bushings follow all of the steps outlined except oil impregnation.

They are inserted, by hand, in the die casting dies and aluminum cast around them. The surface porosity of the bushings permits slight penetration of the molten aluminum, securely locking the bushing.

After casting, these bushings are oil impregnated. Since impregnation is again by soaking, the oil must be removed from the castings before any machining or assembly. Surface oil is removed in a centrifuge.

As an example of the cost saving possible with sintered bushings take the case of one bushing which used to be produced by turning and boring brass bar stock on a screw machine. Production averaged 230 bushings per hour. As a sintering, this bushing is now pressed at 4000 per press per hour and sintered at a rate of 12,000 per hour.

By screw machine methods rejects were as high as 50% due to off tolerances. The sintered bushings show practically no rejects. The saving is obvious.

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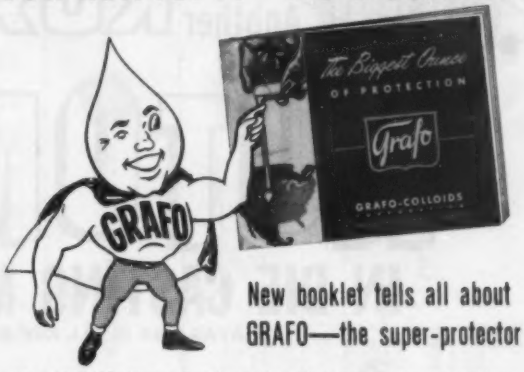
You ask for it—we'll send it!



New booklet tells all about GRAFO—the super-protector

Use GRAFO Water Products for high heat and excessive pressures, for press forging, extruding, etc. Use GRAFO Oil Dispersions for hammer forging, oven conveyors and general industrial applications.

▶ *Send for this booklet, explaining the proper graphite dispersions for specific operations. Use the coupon.*

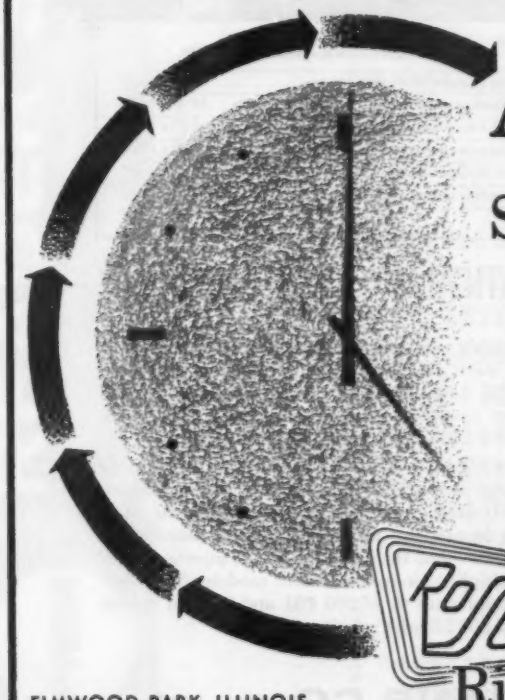
GRAFO COLLOIDS *Corporation* • Sharon, Pa.

Mail this coupon today

GRAFO COLLOIDS CORP.
Wilkes Place, Sharon, Pa.

Please send new booklet on GRAFO colloidal dispersions, to

Name of Company _____
c/o Mr. _____
Street _____
City _____ Zone ____ State ____



Around the Clock

Service and Production

When your production department is yelling at you to get those castings out "yesterday", you'll get the fastest service on your dies by coming to R. O. Schulz. We're set up for speed. We have the machines to make your dies, whether they're 15 tons or a few pounds, and the skilled designers and die makers to make them right. You get top quality workmanship at lowest cost when you take advantage of our specialized die and mold making facilities.

ELMWOOD PARK, ILLINOIS

Richard O. Schulz Company

DIE CASTING DIES • PLASTIC INJECTION AND COMPRESSION DIES

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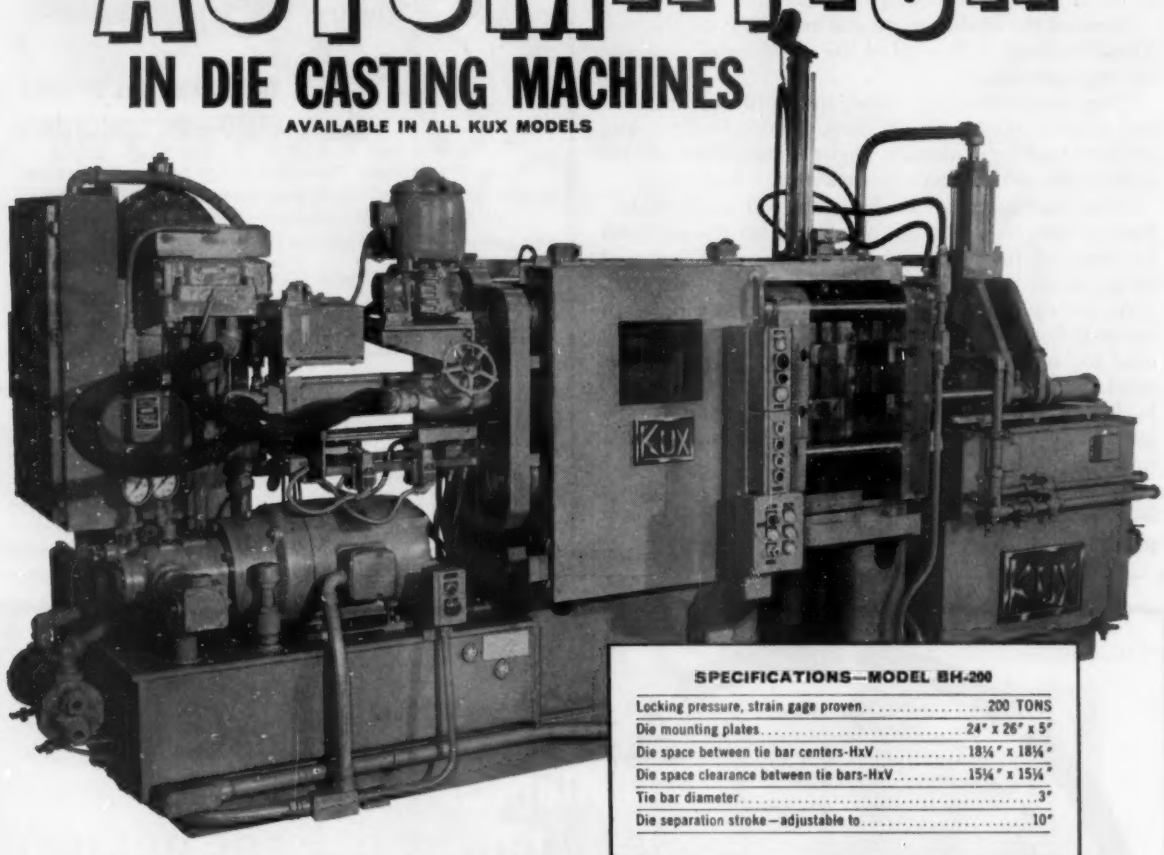
Another **KUX** unsurpassed design superiority

AUTOMATION

IN DIE CASTING MACHINES

AVAILABLE IN ALL KUX MODELS



SPECIFICATIONS—MODEL BH-200

Locking pressure, strain gage proven	200 TONS
Die mounting plates	24" x 26" x 5"
Die space between tie bar centers-HxV	18¼" x 18¼"
Die space clearance between tie bars-HxV	15¼" x 15¼"
Tie bar diameter	3"
Die separation stroke—adjustable to	10"

Up to 900 free cycles per hour...
500 to 700 casting cycles per hour } AUTOMATICALLY — CONTINUOUSLY

You're looking at the new KUX Model BH200—the 200-ton strain gage proven hot chamber die casting machine, which will continuously produce vast quantities of hardware finish castings with minimum maintenance and down time. Automatic operating mechanism permits a cycle with a full 10" of die movement and 6" of metal injection stroke in 4 seconds. A 6¼ lb. zinc shot can be produced in this heavy duty machine at 1800 PSI injection pressure. Sensing safeties retract the die plate and prevent recycling of machine if there is flash on the die surfaces.

Incorporated into this machine cycling mechanism is a low pressure approach of the moveable die plate, flash sensing switches, air jets for cleaning die faces, casting sweep arm, and die lubricating unit with adjustable interval timing. Also available in cold chamber models for casting aluminum with KUX "AUTO-FEED" system of vacuum die casting.

ADDITIONAL FEATURES in the 28 all-new strain gage proven KUX models are the revolutionary "VAC-U-DIE" and "AUTO-FEED" systems of vacuum die casting—motorized die height adjustment mechanism—and the patented KUX injection pressure multiplier for cold chamber models with injection pressures up to 36,000 PSI and plunger speeds up to 12,000 inches per minute.

KUX MACHINE CO. (Dept. P)
6725 North Ridge Avenue, Chicago 26, Illinois

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

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4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
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14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	178	396	414

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- ☐ Investment Castings
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- ☐ Shell Mold Castings
- ☐ None of these

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Cleveland 15, Ohio

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1. **Die Lubricant**—Acheson Colloids Co.—Technical bulletin—on semi-colloidal and colloidal dispersions for dies and other abrasive, high temperature and pressure applications.

3. **Tool Steels**—Allegheny Ludlum Steel Corp.—Technical literature list—describes 125 technical publications on tool steels.

6. **Nickel Plating**—American Smelting & Ref. Co.—Information—on how the Levelmax process produces a bright nickel coating on unbuffed castings.

7. **Die Castings**—American Smelting & Ref. Co.—Technical information—on electrolytically refined high grade zinc and other alloys for die casting.

9. **Die Casting Alloys**—Apex Smelting Co.—Booklet—shows the compositions, properties and other data on Apex die casting alloys.

10. **Investment Casting**—Arwood Corp.—44-page booklet—"Practical Guide to Investment Casting."

11. **Piston Rings**—Auto-Diesel Piston Ring Co.—Catalog—lists plunger rings, tips, liners and combination tip-rings.

15. **Sinterings**—Bunting Brass and Bronze Co.—Engineering handbook—on the design and production of sintered metal parts.

16. **Clipping Press**—B. I. P. Engineering Ltd.—Technical data—on a 34-ton, fast cycle, hydraulic clipping press.

20. **Die Casting Dies**—Crucible Steel Co. of America—Technical data—on CSM 2 steel which eliminates the heat treatment of most zinc die casting dies because of its uniform hardness.

21. **Investment Castings**—Dean Casting & Mfg. Co.—Brochure—lists the applications and advantages of the Acrocast investment casting method.

22. **Standard Unit Dies**—Detroit Mold Engineering Co.—Production information—tells how to make die changes in minutes with standard unit dies.

23. **Furnaces**—Denver Fire Clay Co.—Technical information—on a complete line of furnaces for testing, melting, assaying, heat treating and other special uses.

26. **Small Die Castings**—Gries Reproducer Corp.—Bulletins—lists specifications and prices for small zinc die castings.

27. **Casting**—Hampden Brass & Aluminum Co.—Brochure—shows equipment and facilities for permanent mold and die casting.

28. **Zinc Alloys**—Henning Bros. & Smith, Inc.—Technical booklet—includes production and design data on Zamak zinc alloys for die castings.

29. **Furnaces**—Hevi-Duty Electric Co.—Technical bulletins—on a complete line of melting and holding furnaces for aluminum alloys.

30. **Investment Casting**—Hitchiner Mfg. Co.—13-page facilities booklet—explains the ceramic shell investment casting process and its applications.

32. **Die Casting Machines**—Hydraulic Press Mfg. Co.—Bulletin—describes a line of hot and cold chamber die casting machines in 100 to 2000-ton sizes.

35. **Die Casting Machines**—Kux Machine Co.—Catalog—gives the complete specifications on a full line of die casting machines.

37. **Die Steel**—Latrobe Steel Co.—Data sheet—shows why VDC hot work die steel can mean better die casting dies.

39. **Die Castings**—Litemetal Dicast, Inc.—Design information—tells how to reduce costs with aluminum and magnesium die castings.

45. **Die Castings**—Paramount Die Casting Co.—Brochure—tells how to design die castings.

46. **Mold Lubrication**—Pierce-Waller Inc.—Data sheet—on the Air-Lube system for cleaning and lubricating mold surfaces.

49. **Sinterings**—Reese Metal Products Corp.—16-page booklet—"How to Cut Precision Parts Costs with the Remet Powdered Metal Process."

51. **Ladles**—Spincraft, Inc.—Data and prices—on stainless steel ladles of non-spill design which are 75% lighter than cast iron models.

52. **Automatic Casting Machine**—Stahl Specialty Co.—Technical bulletin—describes the Stahl Autocast automatic machine for permanent mold casting in aluminum alloy.

53. **Compacting Presses**—F. J. Stokes Corp.—Technical information—on a line of high-speed compacting presses with automatic sizing devices.

55. **Fire-Resistant Fluids**—Union Carbide Chemicals Co.—Booklet—"UCON Hydrolubes Spell Safety," tells how to protect your plant with fire-resistant fluids.

56. **Metal Powders**—Vanadium-Alloys Steel Co.—Data sheets—tell how VASCO prealloyed metal powders provide high green strength.

58. **Surface Finishing**—Almco Queen Products Div.—Literature describes the latest metal surface finishing machines, methods and media.

60. **Electrocleaner**—Oakite Products, Inc.—Folder—describes an electrocleaner for zinc die castings which provides a brighter plate and cuts rejects.

76. **Graphite Lubricants**—Grafo Colloids Corp.—Booklet—tells how to choose the proper graphite colloidal dispersions for high-temperature, high-pressure lubrication jobs.

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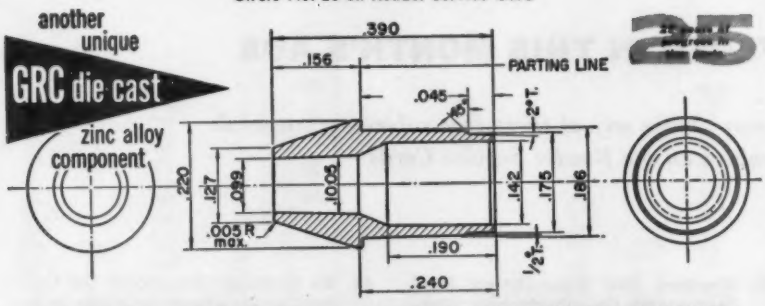
another unique GRC die cast zinc alloy component



GRC CUTS TINY BUSHING COST TO $2.00/M

Die cast by GRC in zinc alloy in a single automatic operation, this former screw machine part for a ball point pen, now costs little more than $2.00 per thousand in lots of a million. Each bushing is uniform, clean and accurate—no cut-off marks, no burrs, no secondary trimming and no scrap loss. Typical of the production economies and wide design latitude which GRC's exclusive patented methods have made possible on parts "no bigger than your thumbnail." (Maximum size is 1¾" long, ½ oz.; no size too small).

Simple or complex, let GRC's unique techniques go to work for you . . . on tiny die cast *and plastic molded* parts made to order . . . on their wide variety of standard parts available in stock—die cast wing and round head thumb nuts and screws, cap nuts, molded nylon screws, gears and pinions—you'll be glad you did.

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INDUSTRY NEWS *(continued)*

NAVY AWARDS RESEARCH CONTRACT

Methods of producing ultra-fine metal powders of high melting point metals such as tantalum, molybdenum and niobium are now under investigation by scientists at National Research Corporation. The study on these refractory metals is being conducted for the Bureau of Naval Weapons under a $73,343 research contract.

CRUCIBLE ELECTS GREGG

GREGG

Walter E. Gregg has been elected Vice President, Technology with Crucible Steel Company of America. His election by the Company's Board of Directors was announced by Joel Hunter, President.

Mr. Gregg, formerly Director of Technology, takes over a position vacated last October when Maurice J. Day, then Vice President, Technology, was named Vice President - Commercial. In his new position, Mr. Gregg will direct research and product and process development activities in Crucible as well as assuming responsibility for the Company's metallurgical and patent and license activities.

A.M.C.O. BUYS PYRON CORP.

American Metal Climax, Inc. has announced the cash purchase of Pyron Corporation. This move enables American Metal Climax to produce both ferrous and non-ferrous metal powders.

Demand for Pyron's iron powders exceeds the present capacity of 7,500,000 lbs. per year. Construction of a new plant in the Niagara Falls area will permit twice the present output.

DiSALLE APPOINTS SALES REPRESENTATIVE

J. FRALICK

The DiSalle Plating & Die Casting Company of Toledo, Ohio has appointed Roy Fralick and Jack Fralick of the Fralick Company to handle the sales in Michigan. Jack Fralick has been associated with die cast products for the past 11 years. Roy Fralick formerly was with Midland-Ross Corporation."

DIE CAST CONSULTANT EXPANDS OPERATIONS

Ervin W. Brudnicki & Associates, Melrose Park, Illinois, are expanding the scope of their business to serve as die cast consultants in any country of the free world.

Organized about 20 months ago by Ervin W. Brudnicki, the company has been awarded assignments in such varied job areas as plant layout, equipment modification, vacuum installation, tool and die design and general trouble-shooting.

Veteran of 25 years in the die casting business, Brudnicki reports that they are qualified to accept consulting assignments in zinc, aluminum and magnesium functional and decorative die casting.

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FREE POWDERED METAL PARTS BOOKLET SHOWS . . .

HOW TO Cut Precision Parts Costs WITH THE Remet POWDERED METAL PROCESS
METAL PRODUCTS CORPORATION
LANCASTER PENNSYLVANIA

colorful, newly revised 16-page booklet illustrates and describes:

- the powdered metal process . . . what it is and does
- gives limitations and advantages of the powdered metal process
- shows design DO's and DON'T's for powdered metal parts
- provides physical characteristics chart of standard Remet materials
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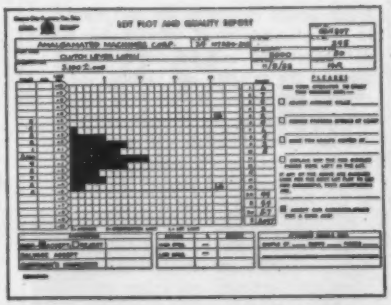
STROH INTRODUCES STATISTICAL QUALITY CONTROL FOR DIE CASTINGS

DIMENSIONAL CONTROL AT STROH DIE CASTING BEGINS WITH A CHART LIKE THIS . . .



Here's what the new concept of Quality Control at Stroh Die Casting means to you

CRITICAL DIMENSIONS can be held within specified limits. Buyers who rely on statistical dimensioning to assure accurate parts for assembly are invited to consult Stroh.

LOWER INSPECTION COSTS come from simpler receiving inspection instead of full sampling of each shipment of die castings. Many manufacturers now benefit from Stroh's Quality Control.

Write for Details

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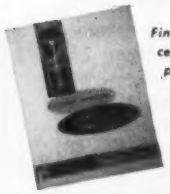
"the HITCHINER way..."

allows flexibility in design with INVESTMENT CASTING

This part is a carrier for a stripper on a citrus peeling machine. It is typical of thousands of irregularly shaped components that are designed with only a particular function in mind and no compromise with production limitations. This type of metal part often requires several changes before the design is finalized.

A late design change in this part, cast in 303 stainless steel, incorporated a 45° bevel, top and bottom on both sides of the serrated pad section. The tooling was altered at very little cost while the cost of the finished casting was not increased at all. The relatively low cost of tooling and tooling changes make the investment casting process an economical and flexible method.

Flexibility in design, a wide freedom of choice in alloy and the elimination of expensive machining operations made possible with the investment casting process may help you solve your parts problems. Send us your sample or blueprint and find out with a Hitchiner "engineered quotation" — no obligation.



Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure on the latest investment casting methods.

HITCHINER
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MILFORD 22, NEW HAMPSHIRE

Coast to Coast Engineering Representatives

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NEW METALLURGICAL PROCESS

A metallurgical process which combines ceramic fibers with metal to attain great strengths was disclosed by Horizons Incorporated, Cleveland process and materials research organization.

While emphasizing that the technique is still in the experimental stage, Dr. Eugene Wainer, vice president and director of research, nevertheless called the results a "Major scientific breakthrough" and a potential solution to some of the problems of space travel and other applications where ultra-high temperature resistance is mandatory.

An amazing increase in structural strength results by combining ceramics with a metal matrix, according to Dr. Wainer. Some of the new high-temperature fibers now available for incorporation in metals have strengths as high as 3,000,000 p.s.i., although strength of the metal matrix alone would, in no case, exceed 500,000 p.s.i. This substantial reinforcement of a metal structure is possible even though the structure is being used at temperatures close to the melting point.

Horizons says there is a good chance that the process will be applied in the casting of high-strength metal parts.

HOWE ELECTED PRESIDENT OF THE MAGNESIUM ASSOC.

Charles A. Howe was elected president of the Magnesium Association at the annual business meeting which was held in London, England. More than 40 of the Magnesium Association's members visited England for a joint one-week meeting with their British counterparts, the Magnesium Industry Council.

DIE CASTING PLANT TO OPEN

Du-Wel Metal Products, Inc., a die casting firm at Bangor, Michigan, plans to open an aluminum die casting plant in Dowagiac, Michigan. This new company will be called Du-Wel Aluminum Products Company and will start production in August.

more industry news, page 77

THE PIERCE-WALLER AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

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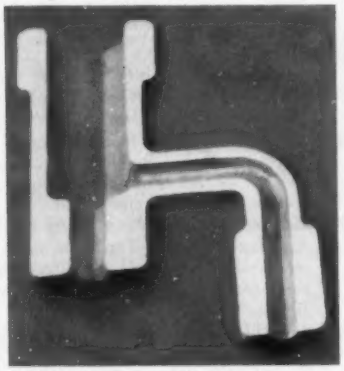

MACHINED to specifications. We maintain a complete machine shop for the specialized machining of investment castings.
Write for our technical brochure on Acrocast precision castings.
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BURR REMOVAL *(cont.)*

The equipment is being used for deburring aluminum die castings, steel stampings, machined parts, tool steel, and other material used in the manufacture of items such as automotive parts, and automated equipment.

Basically, vibratory finishing equipment consists of a bowl to contain the work pieces and media, a spring mounting system on which the bowl is suspended, and a power source which drives an eccentric shaft causing the bowl to vibrate on its mounting.

The vibrator imparts rapid, three-way vibratory movement to the parts and media that might be likened to the pitch and roll of a ship on a stormy sea.

It offers two advantages over previously available deburring methods—versatility and speed.

Vibration action finishes inside and outside surfaces and reaches recessed, shielded and otherwise inaccessible areas.

The media in the vibrating bowl is in a state of partial suspension, eliminating the pressure a large volume of media in a conventional tumbling barrel exerts against the work. Thus, it is possible to finish fragile, delicate parts and many other materials which could not be batch finished in conventional tumbling barrels or by other precision finishing methods.

Speed results from all of the media working on the parts all of the time. All parts are being finished simultaneously. Also, the bowl can be loaded to approximately 90% of capacity as compared with 60% to 75% for conventional tumbling barrels.

These factors combine to cut processing cycles in vibrator bowls to 1/5th the time, even 1/10 the cycle for conventional barrel finishing. One vibrator machine can do more work than 10 to 15 conventional tumbling barrels of approximately equal capacity. This, of course, brings significant savings in floor space as well as savings in time.

Editor's note: *All material in this report furnished by the Wheelabrator Corp.*

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- For lowest cost, production-proved automatic ladling for aluminum and vacuum die evacuation (Morton system)...

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Automatic Permanent Mold Casting Machine

• PORTABLE... Both machines can be moved as a unit to different furnaces for casting different alloys.
• FAST... Automatic Timer eliminates human error. Dies easily interchanged. Dies need less maintenance of refractory coating.
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We can adapt your molds to the AUTOCAST, or make new dies to your specifications.

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- Machining

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EXHIBITOR'S LITERATURE FROM FOUNDRY SHOW

For those who missed the Foundry Show in Philadelphia, here's a list of the exhibitors' literature which was available.

Use the reader service card facing page 70

261 **Permanent Mold Lube**—Joseph Dixon Crucible Co.—Data sheet—tells how to coat dies for permanent mold castings with Graphite Suspension No. 74.

262 **Plunger Lube**—Joseph Dixon Crucible Co.—Data sheet—lists the advantages of a graphite plunger lubricant for cold chamber die casting machines.

263 **Beryllium Copper Alloys**—The Beryllium Corp.—Engineering data—on casting beryllium copper alloys includes processing information.

264 **Aluminum Alloys**—Olin Aluminum—8-page technical booklet—tells how to choose aluminum alloys for casting and gives the physical and mechanical properties.

265 **Crucibles**—Ross-Tacony Crucible Co.—Brochure—gives complete specifications on a line of crucibles and bowls.

266 **Nickel Dies**—The Budd Co.—44-page booklet—tells how nickel dies and patterns are made by the Carbonyl process.

268 **Crucibles**—Vesuvius Crucible Co.—Brochure—tells how Alumelt crucibles can lower the cost of melting and holding aluminum.

269 **Crucibles**—Electro Refractories & Abrasives Corp.—Bulletin—on carbon bonded silicon carbide crucibles and retorts for non-ferrous metals.

270 **Refractories**—American Refractories & Crucible Corp.—Technical data—on mullite base and alumina base refractory ramming mixes for lining furnaces.

271 **Crucibles**—American Refractories & Crucible Corp.—Specifications—on a line of carbon bonded crucibles.

272 **Casting Machine**—Como-Cast Corp.—Brochure—describes a machine which automatically casts slugs and simple shapes in aluminum or brass.

273 **Fluxes**—Foundry Services, Inc.—Data sheet—on Albral fluxes for reducing oxide formations and inclusions in copper base alloys.

274 **Mold Coatings**—Foundry Services, Inc.—Application data—tells how Moldcote mold and core coatings produce smoother, cleaner skins on castings.

275 **Refractories**—General Refractories Co.—38-page booklet—gives specifications on a line of firebricks, heat setting mortar, air setting mortars and other refractories.

276 **Aluminum Alloys**—American Smelting and Refining Co.—brochure tells how the Federated Pressure-Tight process minimizes shrinkage difficulties in permanent mold castings.

277 **Crucibles**—National Crucible Co.—14-page booklet—gives specifications on a line of carbon bonded crucibles and other refractories.

278 **Refractories**—Joseph Dixon Crucible Co.—Data sheets—give specifications and application data on crucibles, furnace linings, and refractory cements.

279 **Shell Mold Casting**—C & S Products Co., Inc.—Brochure—describes a machine that makes 300 lbs. of resin coated sand in 5 minutes.

280 **Furnace Controls**—Inductotherm Corp.—Bulletins—describe high-frequency power sources and control units for induction furnaces and coils.

281 **Melting Furnaces**—International Foundry Supply Co.—Brochure—tells how you can cut your melting costs in half with Revecon and Reverbale melting and holding units for copper, brass, bronze, aluminum and iron.

282 **Aluminum Alloys**—Aluminum Limited—60-page booklet—lists engineering data with process and application information on aluminum alloys.

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INDUSTRY NEWS *(continued)*

DOW TO EQUIP LABORATORY FOR MAGNESIUM CUSTOMERS

The Dow Chemical Company announced plans for a customer-service laboratory designed to assist the automotive industry and other magnesium die casters. William S. Loose, manager of Dow's Magnesium Sales Department, said the $400,000 laboratory will be equipped to demonstrate the most modern techniques for melting and casting of magnesium. It is expected the laboratory can go into full operation by November 1 at Dow's plant in Midland.

They will use the laboratory to provide prototypes or large numbers of parts for customer evaluation in road tests or on proving grounds.

BOLLMAN TO HEAD MARKETING COMMITTEE

Harry Bollman, sales manager of the Newton-New Haven Company, producers of aluminum and zinc die castings, has been named chairman of a newly formed marketing committee by Gordon C. Curry, president of the American Die Casting Institute.

The purpose of the committee will be to investigate the promotional, advertising and sales methods of die casting producers in order to protect the die casting user from misrepresentation regarding quality, safety and standards.

DOEHLER-JARVIS PROMOTIONS

Doehler-Jarvis Division of National Lead Company announced today the following promotions: Claude E. Robitaille has been appointed works manager of the Grand Rapids, Michigan, plant; R. E. Moesser has been named plant controller of Toledo, Ohio, Plant 2; and R. Gordon Roesler has been promoted to assistant sales manager at the Pottstown, Pennsylvania, plants.

PMM OPPORTUNITIES

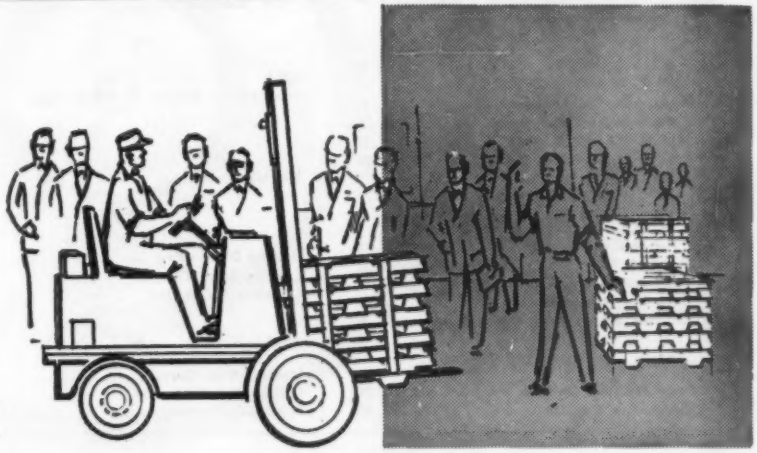
jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Road, Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

POSITIONS OPEN

DISTRICT SALES MANAGER — Investment casting company has an opening for district sales manager to cover a tri-state area in the Middle-West. Position entails total supervisory responsibility for activities of sales representative in the area and technical liaison with customers. Must have degree in mechanical engineering or metallurgy or equivalent. Previous experience in investment casting desirable but not necessary. Our personnel are aware of this ad. Box 7160.

MANUFACTURING ENGINEER—with powder metallurgy experience for expanding eastern, tungsten carbide manufacturer. Box 7260.



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INDEX OF ADVERTISERS

A

Acheson Colloids Co. 9
Ajax-Magnethermic Corp. 16
Allegheny-Ludlum Steel Corp. 27
Almco, Queen Products Div. King-Seeley Corp. 52
Aluminum & Magnesium, Inc. 2
Aluminum Smelting & Refining Co. ....Cov. II
American Smelting & Refining Co. Electro Chemicals Div. 55
American Smelting & Refining Co. Federated Metals Div. 11
American Zinc Sales Co. 13
Apex Smelting Co. ..... Cov. IV
Arwood Precision Casting Corp. 24
Auto-Diesel Piston Ring Co. 68

B

B & T Machinery Co. 39
B. I. P. Machinery Co. 31
Badger Die Casting Corp. 61
Bethlehem Steel Co. 15
Wm. L. Bonnell Co., Inc. 17
Bunting Brass & Bronze Co. 20

C

Cast Master H-P-M Div., Koehring Co. 1
Certified Alloys Co. .....Cov. II
Cleveland Automatic Machine Co. 75
Columbia Tool Steel Co. 61
Crucible Steel Co. of America 5

D

Dean Precision Castings, Inc. 75
Denver Fire Clay Co. 47
Detroit Mold Engineering Co. 21
DiSalle Plating & Die Casting Co. 76
Dodge Steel Co. 31

F

Foundry Services, Inc. 64

G

Grafo Colloids Corp. 69
Gries Reproducer Corp. 72

H

Hampden Brass & Aluminum Co. 60
Henning Bros. & Smith 77
Hevi-Duty Electric Co. 26
Hitchiner Mfg. Co. 74
Hoover Co., The ..... Cov. III
Hydraulic Press Mfg. Co. Div. Koehring Co. 1

I

IDRA 8
International Minerals & Metals Corp. 78

K

Kux Machine Co. 70

L

Latrobe Die Casting Co. 62
Latrobe Steel Company 22
Litemetal Dicast, Inc. 4

M

Madison-Kipp Corp. 23
Marvel Engineering Co. 65
Milwaukee Die Casting Co. 68
Misco Precision Casting Co. 59
Mt. Vernon Die Casting Co. 14

N

National Lead Co. Metal Sales Div. 19
New England Die Casting Co. 32

O

Oakite Products, Inc. 56

P

Paramount Die Casting Co. 66
Pierce-Waller, Inc. 74
Precision Casting Company 6-7

R

Reed-Prentice Corp. 29
Reese Metal Products Corp. 73

S

Schultz Co., R. O. 69
Smith & Sons, Inc., G. W. 67
Solcoor, Inc. 75
Spincraft, Inc. 72
Stahl Specialty Co. 75
Stokes Corporation, F. J. 18
Stroh Die Casting Co., Inc. 73

T

Triulzi, A. 25

U

Union Carbide Chemicals Co. 30

V

Vanadium-Alloys Steel Co. 63

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DIE CASTING *by* HOOVER

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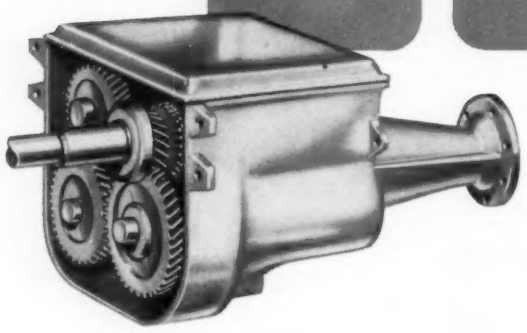
APEX 39-11

(WITH 11% SILICON)



increases yield, saves foundry dollars on tough die casting jobs

When the die casting job calls for greater fluidity and pressure tightness, you'll be money ahead by specifying Apex 39-11. This aluminum alloy, containing 11% of silicon, consistently assures castings of uniform high quality. It permits production to proceed smoothly and results in a quality product, meeting rigid standards of dimensional accuracy. Apex 39-11 castings have good as-cast surfaces and above-average mechanical properties, too. Like all Apex alloys, Apex 39-11 is laboratory-controlled to meet industry's most rigid specifications. Here's another fine product of Apex research—one you can rely on every time!

Research leadership back of every ingot

Send for our helpful booklet, ***Die Casting Alloys.***
Shows composition, properties, other data on Apex products. No obligation.

Warehouse distributor of ALCAN foundry alloy ingot

APEX SMELTING COMPANY

CHICAGO 12 • CLEVELAND 5 • LONG BEACH 10, CAL.
SPRINGFIELD, OREGON (NATIONAL METALLURGICAL CORP.)

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